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The Secretary Ter. Hawaii.

REPORT

OF THE

SURVEYOR

~~Hon. Dunlap,~~

It would seem so but a close reading of the report I would say that there was no gap.

Please hand as laid.

Danbusch

23/4/34.

HONOLULU:
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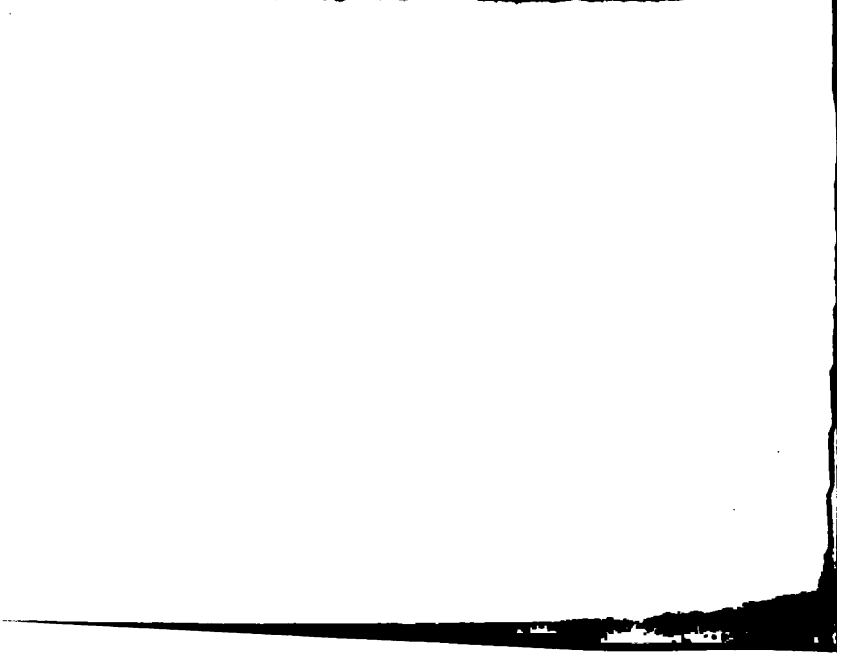
1901.



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The Secretary Ter. Hawaii.

REPORT

OF THE

SURVEYOR

TO THE

Governor of the Territory of Hawaii

FOR THE

YEAR ENDING DECEMBER 31ST

1900

———:o:———

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REPORT

OF THE

SURVEYOR

OF THE

TERRITORY OF HAWAII.

For the Year Ending December 31st, 1900.

To Hon. S. B. Dole,

Governor of the Territory of Hawaii.

Sir:—I have the honor to submit to you the following report of the Bureau of Government Surveying for the year ending December 31, 1900.

As will be seen, the field work outside of this district has been very much curtailed by the fact that the survey of Homestead lots, leases, etc., was discontinued in consequence of the order of the President issued September 11, 1899, in regard to the disposal of the public lands in this Territory, and also in view of the questions which were afterwards raised

in regard to the meaning of Section 73 of the Organic Act, passed by Congress on the 27th of April, 1900. The report of an expert in forestry will also be waited for in regard to the advisability of opening up for settlement certain forest lands in Hawaii and Maui.

HAWAII.

At the beginning of the year, Mr. S. M. Kanakanui was continuing his survey of the Government roads in South Kona, in order that they might be accurately located on our maps, and on the 12th of January he arrived at Alika. After completing the survey of the roads in the two Konas, he was directed to continue the road survey through the district of Kau, which he did, arriving at Waiohinu February 11th. He returned to the office March 5th, where he reduced his work, and made it available for the new map of Hawaii.

Mr. J. S. Emerson, after examining and putting into proper form the records of the triangulation of Hawaii, left for that island May 22nd, for the purpose of identifying and re-marking the remainder of the original trig. stations in the districts of Hilo and Hamakua, which were first occupied twenty years ago. Since then a number of sugar plantations have been started, and many changes have been made in those districts. In several cases the concrete posts marking the stations have been ploughed up, and in some cases the marking stones have been thrown over precipices. Still, many of the underground marks, generally copper triangles, were found where they had been buried in 1881.

On the whole, Mr. Emerson has succeeded beyond all expectation, having restored about two-thirds of the original stations. Out of 71 stations, 46 have been found and remarked; 6 are doubtful, and 19 have been lost beyond recovery. The marking has been done in the most thorough and substantial manner, as described in my former report. Since

his return, July 30th, Mr. Emerson has been revising the triangulation and the calculations of altitude for the Island of Hawaii, and entering the same in suitable books.

In the district of Hilo, Mr. E. D. Baldwin has been employed in making contour maps and profiles, furnishing street lines and grades, drawing plans for the sewerage of the town of Hilo, and surveying proposed extensions of streets and roads in that district.

Mr. A. B. Loebenstein has furnished maps and descriptions of Homestead lots in Niupea, Kaauhuhu, Awini and Puuanahulu, and in December he completed the marking and cutting of division lines in the upper Maulua tract in North Hilo.

OAHU.

In the latter part of August, Mr. Kanakanui was sent to Hauula, Koolauloa, to survey and subdivide the Government lands in that vicinity for Homesteads, which he accomplished in a thoroughly satisfactory manner. Mr. J. S. Emerson has been engaged in recovering, wherever it was necessary, and re-marking in a permanent manner the trig. stations of the district of Honolulu.

CITY SURVEYS.

The numerous public and private improvements under way and projected in this district, and the rapid growth of the city, have called for the services of this Bureau during the past year to an unexampled extent.

For examples, grades have been established and profiles made for nine miles of streets, besides new sidewalk grades for over two miles more, curb grades for about eight miles, street lines for over four miles, profiles run, but new grades not yet established for five miles, and three miles of grades furnished to the Rapid Transit Co.

Besides the above, this Bureau has been frequently called upon to mark out boundaries, and to locate the sites of new buildings so as to conform to street lines. Among other surveys may be mentioned those of the extension of Kukui, Vineyard and School Streets, respectively, to Kalihi. The block above Beretania Street, lying between Punchbowl and Alapai Streets, as well as the block lying between King and Beretania Streets, bounded by Alapai and Victoria Streets, including Thomas Square, were surveyed in detail. As usual, large scale plans of them were drawn on a scale of 20 feet to the inch, showing all buildings and fences, with the present titles of all real estate holdings, besides the original Awards and Grants and subsequent conveyances.

During the past year grades have been established and profiles made of the following streets, viz:

Young Street	1,300	ft.
Beretania Street	1,140	"
Kinau Street	2,650	"
Hotel Street Extension	1,300	"
Lunalilo Street	5,300	"
Green Street	1,350	"
Thurston Street	700	"
Victoria Street	1,400	"
Pensacola Street	1,400	"
Wilder Avenue	1,300	"
Piikoi Street	1,300	"
Kewalo Street	2,650	"
Keeaumoku Street	3,900	"
Makiki Street	2,850	"
Heulu Street	1,075	"
Dominis Street	1,900	"
Nowewehi Street	500	"
King Street	2,500	"

Liliha Street	7,100	ft.
Total	41,615	ft.

Sidewalk grades have been established as follows:

Beretania Street	4,600	ft.
Young Street	300	"
King Street	3,000	"
Miscellaneous	3,000	"
Total	10,900	ft.

The boundary lines were run for the following streets, viz:

King Street	10,000	ft.
Beretania Street	11,000	"
Miscellaneous	1,000	"
Total	22,000	ft.

Curb grades have been given for the following streets:

King Street	5,300	ft.
Young Street	300	"
Beretania Street	11.130	"
Kinau Street	1,900	"
Lunalilo Street	1,600	"
Victoria Street	700	"
Green Street	400	"
King Street North	500	"
Piikoi Street	700	"
Kewalo Street	3,700	"
Keeaumoku Street	7,000	"

Makiki Street	3,200	ft.
Wilder Avenue	1,850	"
Heulu Street	1,000	"
Dominis Street	500	"
Pensacola Street	200	"
Total	39,980	ft.

Profiles have been made of the following streets, of which the grades have not yet been established, viz:

Liliha Street	6,650	ft.
Kukui Street	7,100	"
Pauoa Road	1,570	"
Wyllie Street	1,400	"
Judd Street	1,800	"
Punchbowl Street	700	"
Total	19,220	ft.

Grades have been furnished the Rapid Transit Co. for the following streets, viz:

King Street North	1,500	ft.
Liliha Street	7,100	"
Wilder Avenue, etc.	7,000	"
Total	15,600	ft.

This city work has been under the efficient direction of Mr. Walter E. Wall, whose long experience in this work, and excellent judgment, have been of great service to the Government and the community.

OFFICE WORK.

The nature of the routine work of this office has been fully set forth in former reports, but it may be well at the present time to repeat former explanations on the subject.

A large number of maps, plans and tracings is being constantly called for, and has been furnished for the various departments of the Government, as well as for private parties. For example, the various public improvements, such as the widening, grading and opening of streets, harbor improvements, etc., require many maps and tracings to be furnished from this office. Field parties have to be kept supplied with data, copies of former surveys, etc. Every sale or lease of land by the Government requires that a map and a detailed description by metes and bounds of the land disposed of be furnished by this Bureau. All applications made formerly to the Minister of the Interior and since June 14th, 1900, to the Superintendent of Public Works, for the sale, lease or exchange of Government land, and all questions of title in which the Government is a party, have been referred to this office for reports upon their location, area and value, etc., and for recommendations thereon. The task of arranging, indexing and keeping in order the mass of materials rapidly accumulating in this office, so that any map or other document may be readily found, requires constant labor and care. An important part of the work of the office is the furnishing of information to private persons on a great variety of matters relating to land.

The miscellaneous work of the office during the past year includes the following among other items:

No. of maps registered	1,981
" " Registered copies of surveys furnished	1,045
" " Tracings furnished during the year, estimated	120
" " Blue prints furnished during the year, estimated	300

No. of Reports and official letters	152
" " Copies of surveys furnished	58
" " Chronometers rated	13

The above items cover but a small part of the work done in the office, which mainly consists in the continuation and reduction of the field work, in order to make its results available for the purposes in view. The amount of this kind of work has more than doubled the past year.

HYDROGRAPHIC SURVEYS.

The U. S. surveying ship "Pathfinder," Capt. F. W. Perkins, after completing the survey of Kahului Bay, as mentioned in my former report, sailed for Hilo January 3d, 1900, and spent the remainder of January in making a thorough survey of that harbor and its approaches.

This was followed by the survey of Maalaea Bay in February, besides various hydrographic work in the vicinity of Lahaina, soon after which the "Pathfinder" returned to San Francisco.

Since then two Van Dyke prints of the hydrographic sheet of Maalaea Bay have been furnished to this office by the courtesy of the Superintendent of the U. S. Coast and Geodetic Survey.

METEOROLOGY, MAPS FOR PUBLICATION, ETC.

The regular work of the Weather Service has been carried on during the past year, under the able management of Mr. C. J. Lyons, who has also rendered valuable assistance in the general office work.

The materials for the Weather Record for Honolulu and the Hawaiian Islands for the years 1898 and 1899 are nearly

ready for the press. Tidal observations have been continued with the self-registering tide-gauge. The local standard time has been obtained from observations with the transit, and furnished to the public, as well as the Greenwich time for navigators.

A large map of Hawaii, on a scale of 1:120,000, or 10,000 feet to the inch, which will contain much more information than the map published in 1886, is being drawn in this office, by Mr. John M. Donn, an experienced draftsman, and is approaching completion. It is our intention to have it engraved and published at an early date, to supply a popular demand.

PLANS FOR FUTURE WORK.

It is to be hoped that nothing will stand in the way of the survey and subdivision for Homesteads of such public lands as shall be available for settlers during the coming year. Among other tracts that may be available, the following may be mentioned, viz:

1. The Kamoku and Kapulena tracts in West Hamakua, Hawaii, lying between the lands of Kapoaula and Waikoekoe, and above the various grants already made in the lower portions of these lands.

2. The lands of Koolau and Hamakualoa, Maui, lying between Nahiku and Huelo, above the portions already sold to private parties, for a distance of one and a half or two miles above the sea.

The numerous public improvements in prospect will also call for the services of this Bureau in many ways.

The Superintendent of the U. S. Coast and Geodetic Survey proposes to establish a sub-office in Honolulu, and to commence operations in this Territory at an early date. This will involve the division of the work hitherto carried on by this Bureau, which will be for the advantage of both ser-

vices. In general, the geodetic, astronomical and hydrographic work will be turned over to the Coast and Geodetic Survey, and a division will be made of the material on hand, such as instruments, records, etc., between the two surveys.

It should be remembered that from its very beginning the Hawaiian Government Survey has been in constant correspondence with the U. S. Coast and Geodetic Survey, whose methods have been followed here as far as our circumstances would permit. The Coast and Geodetic Survey has more than once detailed scientific experts from its staff, to make astronomical, magnetic and gravity observations here in cooperation with this Bureau.

EXPENDITURES OF THE SURVEY BUREAU

During the Year 1900.

	Appropriated.	Drawn.	Balance.
Salary of Surveyor	$ 6,000 00	$ 3,000 00	$ 3,000 00
Salary Chief Ass't in Charge of Office	5,400 00	2,700 00	2,700 00
Salary of First Assist'nt	4,800 00	2,400 00	2,400 00
Salary of Sec. Assistant	4,200 00	2,006 67	2,193 33
Salary of Draftsman...	2,400 00	410 89	1,189 11
Salary of Aid.....	1,200 00	450 00	750 00
Salary of Messenger....	960 00	480 00	480 00
Expenses of Survey and Field Work	45,000 00	10,679 51	34,320 49
Office Expenses, Instruments, Published Maps, etc.	2,500 00	624 76	1,875 24

	Appropriated.	Drawn.	Balance.
Meteorology and Tide Gauge	1,500 00	320 42	1,179 58
Salary of Meteorologist	2,400 00	800 00	1,600 00
	$75,910 00	$25,172 23	$50,737 77

ESTIMATED EXPENDITURES OF THE SURVEY BUREAU.

For the Biennial Period 1901-1902.

Salary of Surveyor	$ 6,000 00	
Salary of Chief Assistant in Charge of Office	5,400 00	
Salary of First Assistant	4,200 00	
Salary of Second Assistant	4,200 00	
Salary of Third Assistant	3,600 00	
Salary of Meteorologist	3,000 00	
Salary of Messenger	1,200 00	$27,600 00
GENERAL EXPENSES OF SURVEY.		
Expenses of Field Parties	$36,000 00	
Expenses of Office Work	19,200 00	
Expenses of Publishing Maps	1,600 00	
Expenses of Meteorology	1,200 00	$58,000 00
Total Amount		$86,200 00

I have the honor to remain,
Yours very respectfully,

W. D. ALEXANDER,
Surveyor.

APPENDIX TO THE REPORT OF THE SURVEYOR.

REPORT ON SURVEYS IN HILO.

HILO, January 31, 1900.

To the Government Surveyor,
Territory of Hawaii.

SIR—I beg leave to present the following memorandum of report upon the city work in this district:

The demand for field work has been so great during the past year that we have had but little time for office plotting and furnishing of maps. Numerous *Street Lines* and *Grades* have been given as follows, viz:

On Waianuenue Street, Front Street, Reed Street, Pitman Street, Ponahawai Street, Shipman Street, Bridge Street and King Street.

STREET EXTENSION FIELD WORK.

Pitman Street Bridge and Extension.
Bridge Street, Bridge, Abutment and Extension.
Wharf Street Extension, and
Volcano Street widening.

SEWER WORK.

Outfall sewer, line and grade.

CITY REFERENCE POINTS.

There being calls for City work on all sides, extending beyond our formerly located reference points, it became neces-

sary for us to establish a large number of new reference points within and on the outskirts of the town. Having also found some slight discrepancies in some of the co-ordinates of our old stations, I took this opportunity to relocate the old points with a very exact triangulation based on the Halai-Mokuola-Haaheo triangle. This triangulation work, when completed, checked up almost exactly, regulating the small discrepancies existing in our former co-ordinates.

In connection with this work, we measured one side of one of our triangles along the beach, the calculated length of which was 2,000.67 ft.:

1st measurement of said line with 300 ft. tape. 2,000.59 ft. ..... } Mean
2nd measurement of said line with 300 ft. tape. 2,000.64 ft. ..... } 2,000.62 ft.

This result left no doubt in our minds of the correctness of our work, and the exact location of our reference points, which points we are gradually extending from our verified base. This reference point work took up considerable part of the months of March, April, May and June.

We have also made a complete survey in detail of the region east of the Waiakea river, extending to New Wharf, Reed's Bay, Hoolulu Park, and including the much-contested Waiakea water front; this work being necessary for New Road studies.

Besides the above, I have had all of the Hilo streets profiled, and the town and its vicinity cross-sectioned, for the purpose of making an exact contour map as a basis for sewerage plans. For the Commissioner of Public Lands we have surveyed Kaumana New Road, for the purpose of readjusting the surveys of Ponahawai lots.

MAP AND OFFICE WORK.

General plan of Hilo Street Extension, partly finished.

Contour of Hilo for Sewerage study, partly finished.

Numerous profiles of Hilo streets, partly finished.

Working sheets of Hilo city blocks, partly finished.

Plan of the section east of the Waiakea River, partly finished.

Numerous calculations of reference points, block sides, etc.

Two partly finished working sheets of Kaumana Road.

Several plans and calculations relating to the Kukuau and Waiakea appeal case.

TRACINGS FURNISHED.

To Superintendent of Public Works—

Bridge Street Extension.

Waiakea Water Front.

Wailuku Bridge Abutments.

3 Tracings of Government Lands in Hilo.

To Commissioner of Public Lands—

2 Tracings of Olaa Lots.

4 Tracings in re Kukuau-Waiakea Boundary Case.

In my City work I have been ably assisted by Messrs. T. E. Cook and J. S. Janeway.

Respectfully submitted,

E. D. BALDWIN,
In Charge of Hilo City Surveys.

Hawaii: The Secretary
1903
322120

REPORT

OF THE

SURVEYOR

TO THE

GOVERNOR

OF THE

TERRITORY OF HAWAII

FOR THE

Year Ending June 30, 1902

HONOLULU:
PRINTED BY THE HAWAIIAN GAZETTE CO.
1903.

PROF. WILLIAM DeWITT ALEXANDER.

REPORT

OF THE

SURVEYOR

OF THE

TERRITORY OF HAWAII.

For the Year Ending June 30th, 1902.

DEPARTMENT OF SURVEY,

HONOLULU, T. H., July, 1902.

SIR:—In compliance with your request of the 25th ultimo, I have the honor to submit herewith the report on the operations of the Department of Survey for the twelve months ending on the 30th day of June, 1902.

I have the honor to be,

Respectfully yours,

WALTER E. WALL,
Surveyor.

THE HON. SANFORD B. DOLE,
Governor of the Territory of Hawaii.

322120
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TILDEN FOUNDATIONS
1903

PREFACE.

The brief "History of the Hawaiian Government Survey" and the article on "Land Matters in Hawaii" (Appendix 3 and 4), by Prof. Curtis J. Lyons, will be of interest, not only to the resident familiar with our past history, but to the new comer to the Territory who would understand the country and its institutions.

Prof. Lyons writes with the knowledge derived from practically life-long and intimate acquaintance with all Hawaiian land matters upon which he is a recognized authority.

CHANGES IN ADMINISTRATION.

Prof. W. D. Alexander having resigned his position as the head of this office to take charge of the Branch Office of the U. S. Coast and Geodetic Survey in the Islands, I was appointed to fill the vacancy so caused on the first day of February, 1901.

Reference to the resignation of Prof. Alexander cannot be made without a tribute to the character and services of that gentleman. For a period of over thirty years, beginning with the inception of the Government Survey of the Islands, he was the responsible head of an office that had before it the task of bringing order out of chaos; of performing a work which called alike for high scientific attainments and practical knowledge, and the scope of which was continually widened with its own progress.

From the humble beginning in 1871 when with two youthful assistants he began preparation for the original *base line*, to the day of his resignation, from a well ordered office with its invaluable records, his constant aim was to serve the public.

In appendix 3 and 4 of this report, many of the arduous duties and difficulties confronting Prof. Alexander as Surveyor-General are set forth. How well these duties have been performed and difficulties overcome has been testified to by visitors whose professional standing qualifies them to

speak with authority, and of the lasting value of his services none will doubt who know what these services have been. To those who have been associated with him in his work, and to all acquainted with his character and attainments, it will be a satisfaction to know that in accepting a new position of trust and responsibility, he may still co-operate with the Department which he has served with such distinction.

Preceded by Prof. Alexander, it is not without hesitation that I have undertaken to carry on the work developed under his able direction.

Mr. O. L. Sorenson, who for a long time has assisted in the Office and City work, has been made Chief Assistant.

S. M. Kanakanui, Esq., the well-known Hawaiian Surveyor, who has done much service for the Government, has been appointed First Assistant, but is now on a leave of absence.

Mr. John M. Donn has held the position of Second Assistant and has acted as Chief of the Drawing Division.

It affords me much pleasure to state that Prof. Curtis J. Lyons, not only continues as Director of the Weather Bureau, but renders the Department much valuable professional service in the general office work.

Mr. E. D. Baldwin, who has for so many years been in the employ of the Department, took charge of the Hilo City work and has directed the field parties doing Homestead Surveys in the Hilo and Puna districts from the beginning of the period. Mr. Baldwin's long experience in our method of surveying has made his services of special value. The extensive amount of work performed under his direction has been done in a most thorough and satisfactory manner.

FIELD WORK.

HAWAII.

From the beginning of the period, Mr. E. D. Baldwin has been in charge of the work in the Hilo and Puna Districts, Hawaii, and under his efficient direction, much work has been completed in a satisfactory manner. A detail report by Mr.

Baldwin is given in Appendix 1, which goes to show that, aside from the Homestead Surveys, a considerable amount of city work has been done.

The continuous growth of Hilo City will necessitate an increased amount of work in the future. The public and in many instances, the private improvements continually taking place, will call for the services of the Department in marking street lines and grades and furnishing much detail work in the nature of descriptions by metes and bounds, and plans of all land transfers in connection therewith. I desire to make special mention of the fact that Mr. Baldwin has planned the contemplated improvements as regards street system, grades, etc., etc., with due regard to the expected growth of the city. The citizens of Hilo, and the Government, will derive much benefit from his excellent judgment in this very important work.

A large amount of data is accumulating in the branch office in Hilo which will prove of great worth and convenience to all parties interested in land matters thereabouts.

Mr. Woldemar Muller was employed during part of the months of August, September and December in surveying the upper portion of the Government land of Papa I, in Kona, applied for by Mr. Franz Buchltz, who desired to secure this tract of 930 acres for an agricultural experiment station. The running of the boundary lines of this tract required considerable time, owing to the dense forest growth and the difficulty experienced in finding some of the original marks along the Kahuku boundary that were originally established by careless magnetic surveys. Mr. S. M. Kanakanui completed the boundary work, finding and establishing the location of the original marks at the mauka end with reference to the trigonometrical stations in the vicinity.

He next took up the subdividing of the lower part of the land near the Government road into homesteads of from six to eight acres each. This required a most careful study and location of the abutting grants, there having been some unreliable work in the original surveys.

Complaints, or rather protests, as to the adopted location of the boundary between the private and the Government lands in this section have been received.

We find after a thorough investigation that the Assistant followed our regular rule of making the most favorable interpretation possible in favor of the private parties' titles and that they have suffered absolutely no loss whatever. Mention is made of this merely to show that while the Government's interests are always strictly looked out for, we are just as particular to see that private parties are given due consideration in matters of disputed boundaries.

Mr. Kanakanui and his Assistant, Geo. F. Wright, were occupied from March 1st to 15th in the cutting up of this tract into 18 homesteads.

A roadway, a little over a mile in length, was run from the Government main road through the homesteads to connect with the large tract applied for by Mr. Bucholtz.

After completing the above homestead survey, Mr. Kanakanui's party traveled overland to Ooma, which is situated about five or six miles North of Kailua, North Kona. March 20th. until April 30th. was taken up with the subdividing of 1736 acres of land situated in Ooma I and Kalaoa V, into fifteen homesteads of from 100 to 130 acres each, also with the running out of the boundary of the remaining portion of Ooma II, below the Government Road, a tract of 1031 acres. A 50 foot road, a little over three and one half miles in length and from two to six per cent in grade was run through the homesteads to connect with the Government Road. Another road, a little over one and one half miles through the lower section of these lands, was run, and over two miles of coast line was accurately located.

After running out the boundaries of the remainder of Kealakehe, below the Government Road, a tract of 1653 acres, the party returned Honolulu on May 23rd., 1902.

Mr. Chas. V. E. Dove was employed to resurvey and subdivide a portion of the homesteads at Kaauhuhu, Kohala. His finished working sheet on file is dated December, 1901.

The same surveyor made a survey and subdivision of the makai portion of the homestead lots at Pohakea, Paauilo, Hamakua. This working sheet is dated January, 1902.

Mr. F. L. Lowell went to Hamakua in February to restake the Pohakea and Kaapahu homesteads. This was necessary owing to the destruction of the original stakes and marks (throughout the mauka section) by the forest fires. After going over the lots and pointing out the new marks to the Land Agent, Mr. Lowell made a survey of Grant 2450, Kaiwi, in order to establish the unsettled boundary between this and the Government land, owing to the apparent discrepancies between the old and recent surveys. The natural land marks and general description proved beyond a doubt that the resident was justified in claiming the lot as occupied and improved. We have therefore corrected the boundary line on our record map, which relieves this Hawaiian of much anxiety.

The Bishop Estate being about to make application for the settlement of the boundary of Upolu in N. Kohala, Mr. J. S. Emerson was sent to make a study on the ground of old marks and boundaries. The result of this survey shows an area of something like 125 acres to be in dispute. Advantage was taken of this opportunity to make a complete survey of the Government remnant of the lands of Puuepa II and Kokoiki for future purposes.

OAHU.

Owing to the long interval between the survey and the allotment of the homesteads in Hauula, Koolauloa, the growth of lantana and weeds so completely covered up the marks that it was found necessarry to recover them in July.

Mr. F. L. Lowell who assisted in the original survey, experienced but little difficulty in finding the marks and at the same time made further subdivisions in compliance with a request from the Land Commissioner.

The additional subdivisions have been noted on the map of these homesteads and descriptions of the new lots furnished.

During the month of August, Mr. J. S. Emerson made a survey of a portion of Waianu II and Kaneloa, in Waiahole, Koolaupoko, to locate the Government remainder.

In September he went to Waianae and surveyed the land leased to the Waianae Sugar Co. and the Government remainder available for homesteads.

A survey in detail of the coast, railroad, etc., with reference to the proposed homesteads near the sea shore was taken up and completed in the latter part of October. This section can now be easily subdivided when wanted for homes or seaside residences.

At intervals during the months of November, December and January, a complete survey of the ahupuaa of Waialee and the included "lele" of Pahipahialua was made by the same Assistant with the assistance of Mr. F. L. Lowell. This survey was made for the Department of Public Instruction in compliance with a request received from Prof. W. D. Alexander, Chairman of the Committee of the Board of Education on the Industrial School. The land having been set apart for such an important and worthy purpose, every effort was exercised to make a thorough and accurate location of its boundaries and of the kuleanas included within its limits to avoid any possible difficulties after building operations begin. All the corners of the land and of the kuleanas are marked in a permanent manner, and many of the important points are connected with the well established triangulation stations. In fact, special attention is given in all work of this nature, to connecting enough important and well marked points on the ground with the adjacent triangulation stations, so as to furnish a reliable basis for all subsequent work by surveyors. Full information as to the present owners of the kuleanas was furnished to facilitate adjustments or exchanges in case the Board should deem such steps either necessary or desirable.

Application having been made for the rice and kula land in Kaneloa, Waiahole, Koolaupoko, it was necessary to complete surveys before any transaction could be made.

A complete survey of the entire remnant lying between the Government road and the river was made by Mr. Emerson in the latter part of February. In compliance with a request from the Superintendent of Public Works, and in accordance with the reservation clause in Grant 4111 to L. L. McCandless, Esq., Mr. Emerson was sent to Waiahole in April to locate and mark on the ground a roadway connecting the Government main road makai with the upper portions of the valley.

Instructions were given to Mr. F. E. Harvey in March to make a topographical survey of the mauka section of the land of Lualualei, Waianae, with a view of subdividing this tract into homesteads or ranch properties.

After reserving the upper mountain slopes it was found that there remained on the lower plains an area of 6938 acres, not excluding kuleanas. In accordance with the instructions that followed after submitting the preliminary survey, the tract was subdivided into six lots of nearly equal areas.

The portion of Government land lying between the old and new roads in front of the homesteads in Nuuanu Valley was subdivided into house lots during July.

Shortly after Mr. S. T. Alexander made the generous offer to build for the city a mountain road to run from the head of Makiki street to the present Tantalus Road terminus, by way of Round Top and Sugar Loaf, at a cost not to exceed $15,000, our engineers made a complete survey of the proposed site.

The plans giving cross sections at points not more than 100 feet apart for a length of 5, 16-100 miles, with an estimate of the cut and fill necessary for construction, were, on completion, submitted to the Assistant Superintendent of Public Works. This roadway, if built as proposed by Mr. Alexander, will pass through the most desirable section of the Government's upper lands suitable for mountain houses or summer residences. The light grade—5% or less—and long graceful curves, will make it possible to drive either up or down at a fair rate of speed.

MISCELLANEOUS SURVEYS.

Government remnant in Hamamakawaha, Manoa Valley.

Location of boundary of the land of Kewalo-uka to define the lines of the Agricultural Experimental station and proposed Park Reservation near Punchbowl Crater, Honolulu.

Proposed U. S. Marine Quarantine Reservation on the South slopes of Diamond Head Creater.

Ili of Waiaka, Kamoiliili.

Luakaha, Nuuanu Valley, various parcels of land for Government—Cooke—Atherton exchanges to conform to new Valley Road.

A few choice house lots were laid out in the Kaluaopalena remnant, Kapalama, Kona.

CITY SURVEYS.

There has been a great amount of city work done under the efficient direction of Assistant Sorenson, who has, as opportunity offered, in addition to the regular work, placed in a systematic manner substantial reference monuments through a portion of the city on offsets to the street lines. After completing the system it is our intention to make a careful traverse, and to establish the exact location of these monuments by determining their co-ordinates with reference to the trigonometrical station Puowaina, or Punchbowl. The exact elevations with reference to the standard City Datum will be determined in order that perfectly reliable Bench Marks for grade work may be had at convenient points.

After this arrangement is completed, it will materially reduce the difficulties to both the Government and private surveyors in establishing locations and connecting with points for future reference.

Mr. S. M. Kerns has taken a deep interest in the improvements to the streets of Honolulu and his persevering and successful efforts have done much to better the general appearance of the city. He has done nearly all of the engineering work for the Grade Commissioners and has been most faith-

ful in his inspections to see that the established grades have been adhered to.

Special attention has been given to the furnishing of the new street lines and grades for new buildings.

There have been 403 building permits acted upon, 106 of which were for buildings or stores in the business portion of the city, where the new adopted street lines and grades were given so as to secure uniformity in the street lines and grades.

The remaining 297 permits were for residences, a large portion of them being in the insanitary districts. Here grades were given for filling in, and checked after the filling had been done, as required by the Board of Health regulations.

The proper line and grade have been given for all catch-basins for the storm sewers in different parts of the city.

The Water Works Department were furnished with the line and grade for fire plugs and the lowering of water pipes in the different streets, as follows:

Makiki Street	2,000 ft.
College Street	700 "
Nuuanu Avenue	500 "
Beretania Avenue	1,500 "
Smith Street	300 "
Maunakea Street	300 "

On account of the adoption of new grades on some of the streets in the city, the Hawaiian Tramway Co. found it necessary to raise or loewr their tracks as the case may be, and grades were given as follows:—

Beretania Av. from Nuuanu Av. to Fort St.	300 ft.
Nuuanu Ave. from Chaplain Lane to Kukui St.	900 "
King St. North of King St. Bridge	1,200 "
King St., near South St.	300 "

Substantial pegs 2"x4" were driven every hundred feet on the extension of Piikoi St. from King Street to Sheridan St. These pegs were set to the grade adopted by the Grade Com-

missioners to assist the property owners in building the street and raising their low unsanitary lands in that section to an elevation acceptable to the Board of Health. This fill will amount to from three to five feet for a distance of 2130 feet.

Grade and line have been given for the following bridges and culverts.

On Anapuni Street above Wilder Avenue;
On Dominis Street, Waikiki of Makiki Street;
On Hastings Street, Waikiki of Makiki Street;
for concrete culverts on Kewalo Street, Makiki Street and Keeaumoku Street; on Queen Street for the new Kewalo ditch and culverts:—

Street lines were given for

Puunui Avenue	1,000 ft.
Wyllie Street	300 "
Queen Street between Maunakea Street and King Street Bridge	900 "
Queen Street from Punchbowl Street to Coral Street	1,200 "
South Street below Queen about	500 "

Surveys were made for the extension of Dole Street from Artesian to Metcalf Street, a distance of 700 feet; and also of Makiki Street from 150 feet above Hastings Street to Makiki Stream, distance 600 feet.

OTHER MISCELLANEOUS SURVEYS FOLLOW:

Government Lot at South corner of Kawaiahao and South Streets.

Staking out and placing permanent marks along the streets in the Kakaako and Kewalo section of Honolulu.

Kakaako Drainage Ditch.

Site for "Hackfeld Wharf."

Location of U. S. Naval Wharves.

Location of Channel Wharf.

Kuakini Street extension from Nuuanu Avenue to Punchbowl Street.

Pacific Heights Electric Railroad from Nuuanu Avenue to Nuuanu stream.

Bates Street extension.

U. S. Naval Reservation lot at the East corner of Halekauwila and Richards Streets.

Makiki Drainage ditch and lots, exchange for same through Mr. S. C. Allen's land.

Hotel Street extension from Punchbowl Street to Alapai Street.

Staking on the wharf, site for the new I. I. S. Nav. Co's. shed.

Booth lot on Waikiki Road opposite the Waikiki Inn.

Fort Street extension, near School Street.

Water lots near the Bishop Estate's new slips.

Road from new wharfs at head of Honolulu Harbor to Iwilei Road.

Sunny South Premises, Waikiki Road.

School Street widening from Nuuanu Avenue to Fort Street.

Kalakaua Avenue running through the "Old Plantation" or Ward Homestead, from a point on King Street near Kapiolani Street to the Kewalo Section.

Portion of Insane Asylum Road near King Street.

Waikiki Road widening has necessitated some work on the ground, and School Street extension has been staked in places to show the cuts to private properties.

NEW LINES MARKED ON THE GROUND FOR WIDENING OF STREETS.

King Street from Nuuanu Bridge to junction of King and Beretania to 80 foot width.

King Street from Liliha Street to and through the Kapalama section to a width of 60 feet.

Alexander Street from Bingham Street to Beretania (Ewa side) widened 25 feet, making a 60 foot street.

Asylum Road from King Street, mauka, widened on Waikiki side about 15 feet. 500 feet done.

Beretania Avenue from Nuuanu Avenue to junction of King and Beretania widened to a 60 foot street. 2,000 feet done.

Fort Street, strip in front of McIntyre Building, corner King and Fort Streets.

Entire Ewa side of block from Hotel to Beretania with exception of Mott-Smith lot and lot on corner of Fort and Beretania. Average width increased 10 feet.

Two strips opposite Catholic Convent. Average 3 feet.

Strip in front of new Sachs' Building, widened 12 feet.

Hotel Street, strip in front of Oregon Building, widened 10 feet.

Strip in front of Elite Building, widened 10 feet.

Strip in front of Waterhouse property, widened, 10 feet.

Strip in front of Haalelea Lawn, widened 19 feet.

Strip in front of U. S. Government Reservation (old barracks), widened 9 feet.

Strip in front of McGrew Property (cor. Punchbowl), widened 9 feet.

Liliha Street, widened to 60 feet from 50 foot street, 10 feet wide and 1,000 feet long from King to Vineyard Streets.

Nuuanu Avenue from Beretania Avenue to School Street, 2,000 feet long.

From Kuakini Street to Bates Street, 700 feet long.

Nowewehi Street at corner of Nowewehi and Makiki Streets widened on mauka corner so as to ease the drive from Hastings Street and Makiki into Nowewehi.

Wilder Avenue from about 300 feet East of corner of Alexander Street to Metcalf both sides of street widened from a 30 foot street to a 60 foot street.

Punchbowl Street between Halekauwila and Queen Streets.

Maunakea Street above Queen.

Miller Street between Beretania and Vineyard Streets.

Vineyard Street, mauka line between River and Liliha Streets.

Punchbowl Street opposite Emma Street.

Punchbowl and Halekauwila Streets, junction of

GRADES GIVEN FOR THE HONOLULU RAPID TRANSIT & LAND CO'S TRACK.

The Grade Commissioners first made a careful study of the adopted or existing grades, curbs and all improvements of whatever nature along proposed routes of the Honolulu Rapid Transit and Land Company, before final grades were given, and every effort has been exercised to improve the grades where possible on the following streets:—

King Street from Nuuanu River to Kamehameha IV Road	9,000 ft.
King Street from Iwilei Road to South St.	5,600 "
King Street from Alapai Street to Punahou Avenue	6,600 "
King Street from Punahou Avenue to McCully Street	2,200 "
Alexander Street from Wilder Avenue to Beretania Avenue	1,500 "
Beretania Avenue from Alexander Street to McCully Street	900 "
Emma Street from Beretania Avenue to School Street	2,080 "
Alakea Street from Hotel Street to Beretania Avenue	700 "
Nuuanu Avenue from Kuakini Street to Judd Street	1,500 "
McCully Street from Beretania Avenue to Waikiki Road	3,200 "
Waikiki Road from King Street to Kapiolani Park	10,650 "
	44,330 ft.

Street lines furnished for Track to Honolulu Rapid Transit & Land Co.:

King Street from Nuuanu River to Kamehameha IV Road	9,400 ft.
King Street from Alapai Street to Punahou Avenue	6,600 "
King Street from Punahou Avenue to McCully Street	2,200 "
Alexander Street from Wilder Avenue to Beretania Avenue	1,500 "
Beretania Avenue from Alexander Street to McCully Street	900 "
McCully Street from Beretania Avenue to King Street	700 "
	21,300 ft.

Line staked for Poles of Honolulu Rapid Transit and Land Co.:—

King Street from Nuuanu River to Kamehameha IV Road	18,800 ft.
King Street from Punahou Avenue to McCully Street	4,400 "
Alexander Street from Wilder Avenue to Beretania Avenue	1,500 "
Beretania Avenue from Alexander Street to McCully Street	1,800 "
McCully Street from Beretania Avenue to King Street	1,400 "
	27,900 ft.

Lines given for Electric and Telephone Poles:—

Ala Moana from Richard Street to Sewer Pumping Station	2,000 ft.
Fort Street from Hotel to Kukui Street	1,200 "
Hotel Street	700 "
	3,900 ft.

PERMANENT STREET MONUMENTS, REFERENCE MARKS, AND BENCH MARKS.

Beretania Avenue, junction of King Street and Beretania Ave.

Maunakea Street.
Nuuanu Avenue.
Emma Street.
Richards Street.
Miller Street.
Angle between Miller and Punchbowl Streets.
Punchbowl Street.

Hotel Street

Punchbowl Street.
Miller Street.
Richards Street.
Alakea Street.
Nuuanu Avenue.
Maunakea Street.

Pauahi Street

Nuuanu Avenue.
Kekaulike Street.

King Street

Liliha Street.
Angle 300 feet South of King Street Bridge.
Maunakea Street.
Nuuanu Avenue.
Alakea Street.
Richards Street.
Mililani Street.
Likelike Street.
Punchbowl Street.

Merchant Street

Alakea Street.

Queen Street

Fort Street.
Alakea Street.
Punchbowl Street.
South Street.

South Street.

Angle between Queen and Halekauwila Streets

Ala Moana

South Street.
Quarantine Street.
Richards Street.

Esplanade

Alakea Street.
Fort Street.

Allen Street

Fort Street.

Halekauwila Street

Kekuanaoa Street.
Alakea Street.
Mililani Street.
Punchbowl Street.

Nuuanu Avenue

Angle mauka of Beretania Avenue.
Kukui Street.

Vineyard Street

Angle Waikiki of Nuuanu River.
Angle Ewa of Nuuanu River.

Liliha Street

Vineyard Street.
School Street.
Dayton's Lane.
Judd Street.
Angle above Judd Street.
Wyllie Street.

Keeaumoku Street

Lunalilo Street.
Wilder Avenue.
Heulu Street.
Dominis Street.
Nowewehi Street.

This work has been done at a very slight extra cost to the Department as it was done at odd times by the regular force of the Survey. The material and labor being furnished by the Department.

Profile Maps of the following streets, showing position and elevation of car tracks, sewers, sidewalks and streets, were drawn for the Grade Commissioners.

Beretania Avenue from Richards Street to King Street	2,500 ft.
Kewalo Street from Lunalilo Street to Nowewehi Street	3,000 "
Kinau Street from Alapai Street beyond Makiki Street	5,400 "
Lunalilo Street from Alapai Street to Makiki Street	5,800 "
Makiki Street from Beretania Avenue to Makiki Stream	5,100 "

Piikoi Street from King Street to above Wilder Avenue. .....
Punchbowl Street from Emma Street to Pauoa Road. .....
Thurston Avenue from Victoria Street to Wilder Avenue. .....
Victoria Street from King Street to Spencer Street. .....
Punahou Avenue from King Street to Manoa Road. .....
Wilder Avenue from Pensacola Street to Alexander Street. .....
Hotel Street (Extension) from Punchbowl Street to Kapiolani Street.....
Liliha Street from King Street to School Street. .....
Liliha Street from School Street to Judd Street. .....
Liliha Street from Judd Street to Wyllie Street. .....

CURB GRADES AND LINES GIVEN.

King Street from Nuuanu River Bridge to Oahu Lumber Co. (mauka).....	1,300 ft.
(makai side 10 ft. sidewalk, mauka side, 8 ft. sidewalk).....	1,300 "
King Street resetting curb to new line, Kaiulani School, Reform School and Kalihi Fire Station, in all (8 ft. sidewalk).....	800 "
King Street Miscellaneous from Asylum Road to Kamehameha School.....	300 "
King Street Miscellaneous—River Street to South Street.	600 "
King Street Miscellaneous—Alapai Street to McCully Street.	9,850 "
Aala Street from King to Beretania (10 ft. sidewalk)..	500 "
Ala Moana (15 ft. sidewalk).....	1,000 "

Alakea Street	300	ft.
Alapai Street	400	"
Alexander Street	200	"
Anapuni Street from Wilder Avenue to Hastings Street	2,500	"
Asylum Road from King Street mauka	500	"
Beretania Avenue Miscellaneous	15,000	"
Bingham Street	200	"
Bishop Street from King to Hotel	500	"
College Street from Wilder Avenue to Hastings Street	1,800	"
Dole Street from Punahou Avenue to		
Dominis Street from Kewalo Street to Punahou Avenue	2,500	"
Emma Street from Beretania Avenue to School Street	3,100	"
Fort Street Miscellaneous	1,400	"
Green Street	500	"
Heulu Street from Kewalo Street to Makiki	2,000	"
Hotel Street Miscellaneous	2,400	"
Hastings Street	300	"
Kinau Street	1,300	"
Kukui Street Miscellaneous	400	"
Liliha Street	2,000	"
Makiki Street from Wilder Avenue to Makiki Reservoir	3,212	"
Miller Street	100	"
Nuuanu Avenue Miscellaneous	6,000	"
Nowewehi Street	1,250	"
Pauahi Street	800	"
Pensacola Street	300	"
Piikoi Street	1,400	"
Matlock Street	2,600	"
Richards Street	300	"
River Street	900	"
Union Street	100	"
Vineyard Street	500	"

Waikiki Road. ..... 350 ft.
Wilder Avenue.. ..... 2,100 "

GRADES RUN AND PROFILES MADE.

King Street from Nuuanu River to Kamehameha IV Road..... 9,400 ft
King Street from Iwilei Road to South Street. . ..... 5,600 "
King Street from Alapai Street to Punahou Avenue. . ..... 6,600 "
King Street from Punahou Avenue to McCully Street. ..... 2,200 "
King Street from McCully Street—East.... 2,800 "
Alexander Street from Wilder Avenue to Beretania Avenue ..... 1,500 "
Anapuni Street from Wilder Avenue to Hastings Street.. ..... 1,300 "
Beckwith Street (College Hills Tract)..... 1,250 "
Beretania Avenue from Alexander Street to McCully Street. ..... 900 "
Beretania Avenue from Nuuanu Avenue to junction of King and Beretania Ave... 2,000 "
Bingham Street from Punahou Avenue to Metcalf Street. ..... 1,400 "
Chaplain Lane from Fort to Nuuanu Avenue 350 "
College Street from Wilder Avenue to Hastings Street. ..... 1,300 "
Booth Road. ..... 1,420 "
Damon Street (College Hills Tract)..... 625 "
Dole Street. ..... 1,000 "
Dominis Street. ..... 1,800 "
Emma Street from Beretania Avenue to School Street. ..... 2,080 "
Fort Street (Extension) from School Street to Pauoa Road ..... 2,100 "
Green Street. .....
Heulu Street from Kewalo Street to Makiki Street. ..... 1,050 "

Hotel Street (Extension) from Punchbowl Street to Alapai Street	1,400	ft.
Hastings Street from Makiki to Punahou Avenue	800	"
Kukui Street (Extension) from River Street to Liliha	1,600	"
Kinau Street	1,300	"
Kuakini Street (Extension) from Nuuanu to Punchbowl Street	1,600	"
Luso Street	1,000	"
Makiki Street from Wilder Avenue to Reservoir	1,500	"
Nuuanu Avenue from Chaplain Lane to Bates Street	5,000	"
Nowewehi Street from Kewalo to Makiki Street	500	"
Pauoa Road from Nuuanu Avenue to Punchbowl Street	1,500	"
Piikoi Street (Extension) from King Street to Sheridan	2,000	"
Prospect Street from Kapiolani Street to Magazine Street	1,900	"
Punahou Avenue from King Street to Manoa Road	3,300	"
Punchbowl Street from Luso Street to Pauoa Road	3,000	"
Queen Street from Nuuanu Avenue to King Street Bridge	1,100	"
Matlock Street	1,300	"
Marin Street	500	"
School Street from Nuuanu Avenue to Liliha Street	2,600	"
School Street (Extension) from Liliha Street to Kamehameha IV Road	14,812	"
The Alexander Tantalus Road 5, 16-100 miles or	27,250	"
McCully Street from Beretania Avenue to Waikiki Road	3,200	"

Waikiki Road from King Street to Kapiolani Park	10,650 ft.
	140,187 ft.

GRADES ADOPTED BY THE COMMISSIONERS.

King Street from Nuuanu Bridge to Kamehameha IV Road	9,400 ft.
King Street from Alapai Street to Punahou Avenue	6,600 "
King Street from Punahou Avenue to McCully Street	2,200 "
Alexander Street from Wilder Avenue to Beretania Avenue	1,500 "
Anapuni Street from Wilder Avenue to Hastings Street	1,300 "
Beretania Avenue from Alexander Street to McCully Street	900 "
Beretania Avenue from Nuuanu Avenue to junction of King and Beretania Avenue	2,000 "
Bingham Street from Punahou Avenue to Metcalf Street	1,400 "
College Street from Wilder Avenue to Hastings Street	1,300 "
Dominis Street from Kewalo Street to Punahou Avenue	1,800 "
Heulu Street from Kewalo Street to Makiki Street	1,000 "
Hastings Street from Makiki Street to Punahou Avenue	800 "
Nuuanu Avenue from Chaplain Lane to Bates Street	5,000 "
Nowewehi Street from Kewalo Street to Makiki Street	500 "
Piikoi Street (Extension) from King Street to Sheridan Road	2,000 "
Queen Street from Nuuanu Avenue to King Street Bridge	1,100 "

McCully Street from Beretania Avenue to Waikiki Road. ..... 3,200 ft.
Waikiki Road from King Street to Kapiolani Park. .....10,650 "

52,650 ft.

OFFICE WORK.

When not in the field, the time of the Assistants has been fully occupied with calculations and map making.
The following maps have been made:

MAPS.

Waiahole, Koolaupoko, Oahu,
3 maps, scale 100′=1″

Lualualei, Waianae, Oahu,
1 map, scale 500′=1″

Lualualei, Waianae, Oahu,
reduction
scale 5,000′=1″

Waialee, Koolauloa, Oahu,
1 map, scale 100′=1″

Waialee, Koolauloa, Oahu,
1 map, scale 500′=1″

Puuepa II and Kokoiki, Kohala, Hawaii,
1 map, scale 500′=1″

Portion South Slopes of Diamond Head,
1 map, scale 100′=1″

Wilder Avenue Widening,
1 map, scale 50′=1″

Makiki Drainage Ditch,
1 map, scale 50′=1″

King Street Widening—Alapai Street South,
1 map, scale 20′=1″

Papa II, Kona, Hawaii, Bdg. Study of
1 map, scale 2,000′=1″

Plans were made of:—

The widening of King Street from King Street Bridge to junction of King Street and Beretania Avenue;

Nuuanu Avenue from Kukui Street to Beretania Avenue;

Dole Street (Extension);

The widening of Alexander Street from Bingham Street to Beretania Avenue;

Wilder Avenue widening from Metcalf Street to within 500 feet of Alexander Street;

Young Street from Punahou Avenue 3,700 feet East.

A complete set of maps of the Islands showing all Government lands was furnished for the Governor's Report of 1901 and several duplicate copies were given to the Land Commissioner for use in his office.

These maps have proven to be quite useful for general use and reference in dealing with applications for Government lands.

Plain maps of the Islands were furnished the Commissioner of Agriculture on which to note the nature of the forests as reported on by Forest Expert Griffiths.

Maps of the City of Honolulu and block prints for detail record of the street numbering system was furnished the Public Works Department, and on February 8th, 1902, City Numberer, A. E. Murphy, Esq., acknowledged receipt of all data bearing on the numbering system as planned by the Department. At the time of his writing, Mr. Murphy had found all numbers placed to date in accordance with the adopted system which was proving satisfactory in every respect.

It might be added here that the numbering as adopted for Honolulu is quite the same as San Francisco has since

adopted after a thorough study of the systems in many cities in the East and elsewhere.

The general work of the office has been carried on in quite the same lines as those prevailing in January, 1901.

The number of maps, tracings, plans, prints, and descriptions applied for by the various departments of the Government have shown a marked increase during the past year. The field parties have required many tracings, copies of former surveys and such data. The various public improvements have necessitated much work, on our part, in furnishing street lines, grades, descriptions of all lands taken for public purposes, and in most transactions, reports were submitted giving areas, valuations and recommendations. The correspondence shows that four hundred and eleven letters were written, many of which were carefully considered reports on applications for the acquirement of Government lands by purchase, lease or otherwise.

With the increased field and office work and the consequent accumulation of records, it has taken much time to keep new data up and indexed to date.

Three hundred and ninety-eight Grants have been platted in on the registered maps and there now remains but the adding of a limited number of Government deeds to bring this important work up to date.

Block tracings of the principal portion of Honolulu, giving the frontages, areas, etc., have been furnished to the Tax Assessor's office. This involved a vast amount of computations and will be of great assistance to the Assessor in arriving at fair appraisements. A few maps have also been prepared for the Assessors in the outer districts. Some idea of the amount of miscellaneous work done in the office during the past year may be gathered from the following, which does not by any means include all the items that might be mentioned:

BLOCKS WITH AREAS AND FRONTAGES FURNISHED TO ASSESSOR'S OFFICE.

Bounded by King, Punchbowl, Hotel and Alapai Streets.
" " Hotel, Punchbowl, Beretania and Alapai Streets.
" " Queen Street, Punchbowl Street, King Street, Kawaiahao Lane, Chamberlain Street, and Mission Lane.
" " Queen Street, Mission Lane, Chamberlain Street, and South Street.
" " Chamberlain Street, Kawaiahao Lane, King and South Streets.
" " Fort, Kukui, Nuuanu and Vineyard Streets.
" " Fort, Vineyard, Nuuanu and School Streets.
" " Alakea Street, Hotel Street, Adams Lane, Union Street and Beretania Avenue.
" " Adams Lane, Hotel and Union Streets.
" " Hotel Street, Fort Street, Beretania Avenue, Garden Lane and Union Street.
" " Union Street, Garden Lane and Beretania Ave.
" " School, Lilliha, Kuakini Sts. and Nuuanu Ave.
" " Beretania Avenue, Punchbowl, Miller, Kinau and Alapai Streets.
" " Merchant, Fort, King and Alakea Streets.
" " Wilder Avenue, Kewalo, Heulu and Keeaumoku Streets.
" " Heulu, Kewalo, Dominis and Keeaumoku Sts.
" " Dominis, Kewalo, Nowewehi and Keeaumoku Streets.
" " Kewalo, Nowewehi and Keeaumoku Streets. (North).
" " Wilder Avenue, Keeaumoku, Dominis and Makiki Streets.
" " Dominis, Keeaumoku, Nowewehi and Makiki Streets.
" " Heulu, Keeaumoku, Dominis and Makiki Streets.
" " Keeaumoku, Nowewehi and Makiki Sts. (East).

Bounded by Vineyard Street, Nuuanu River, School Street and Nuuanu Avenue.
" " Emma and Vineyard Streets. (South.)
" " Halekauwila, Richards, Queen and Mililani Sts.
" " Halekauwila, Mililani, Queen and Punchbowl Streets.
" " Punchbowl and Queen Streets. (South.)
" " Beretania Ave., Miller and Punchbowl Streets.
" " Emma Street and Beretania Ave. East and Emma Street, Beretania Avenue and Nuuanu Avenue.
" " Miller Street, and Beretania Avenue. (North).
" " Nuuanu Avenue, Kukui Street and Kukui Lane.
" " Kukui Lane, Kukui Street, Fort Street, Beretania and Nuuanu Avenue
" " Fort Street and Beretania Avenue. (East).
" " Alapai Street, Beretania Avenue, Kapiolani and Kinau Streets.
" " Kinau Street, Kapiolani Street, Beretania Avenue and Victoria Street.
" " Victoria, Kinau, Pensacola Streets and Beretania Avenue.
" " Alapai, Quarry and Lunalilo Streets.
" " Lunalilo, Kapiolani and Kinau Streets.
" " Kapiolani, Lunalilo, Victoria and Kinau Streets.
" " Victoria, Lunalilo, Pensacola and Kinau Streets.
" " Alapai, Green, Hackfeld and Quarry Streets.
" " Hackfeld, Green, Kapiolani and Lunalilo Streets.
" " Kapiolani, Green, Victoria and Lunalilo Streets.
" " Victoria, Thurston, Wilder, Pensacola and Lunalilo.
" " Pensacola Street, Wilder Avenue, Piikoi and Lunalilo Streets.
" " Alapai, Hackfeld, Spencer and Green Streets.
" " Hackfeld, Spencer, Kapiolani and Green Sts.
" " Kapiolani, Spencer Victoria and Green Sts.
" " Victoria, Spencer, Magazine and Thurston Sts.
" " Thurston, Magazine and Spencer Sts. (East).

Bounded by Wilder Ave., Pensacola and Piikoi Sts. (North).
" " Alapai, Prospect, Hackfeld and Spencer Streets.
" " Hackfeld, Prospect, Kapiolani and Spencer Sts.
" " Kapiolani, Prospect, Magazine and Spencer Sts.
" " Spencer and Magazine Sts. (East).
" " Alapai, Prospect and Hackfeld Sts. (North).
" " Hackfeld and Prospect Sts. (North and East).
" " King, Alakea, Hotel and Richards Sts.
" " Beretania Avenue, Miller, Hotel and Richards Streets.
" " Beretania Avenue, Punchbowl, Hotel and Miller Streets.
" " Punchbowl, Kinau and Miller Streets.
" " Fort, School and Emma Streets. (South).
" " Emma, Kinau and Punchbowl Streets. (South).
" " King, Maunakea, Hotel and Smith Streets.
" " King, Smith, Hotel Streets and Nuuanu Avenue.
" " Queen, Alakea, Merchant and Richards Streets.
" " Merchant, Alakea, King and Richards Streets.
" " Queen, Richards, Merchant, King and Mililani Streets.
" " Queen, King and Kekaulike Streets.
" " Queen, Maunakea, King and Kekaulike Streets.
" " Beretania Avenue, Maunakea, Pauahi and River Street.
" " Pauahi, Maunakea, Hotel and Kekaulike Streets.
" " Pauahi, Kekaulike, Hotel and River Steets.
" " Hotel, Maunakea, King and Kekaulike Streets.
" " Hotel, Kekaulike, King and River Streets.
" " Vineyard Street, Nuuanu Avenue, Kukui and River Streets.
" " Kukui Street, Nuuanu Ave., Beretania Ave. and River Street.
" " Part of Kukui and River Streets. (North).
" " Part of Beretania Avenue and River. (North).
" " Beretania Avenue, Kapiolani, Young and Alapai Streets,
" " Young, Kapiolani, King and Alapai Streets.

Bounded by Makiki Street, Wilder, Punahou and Beretania Avenues.
" " Punahou, Beckwith, Alexander and Dole Streets.
" " Punahou, Dole, Alexander and Bingham Streets.
" " Punahou, Bingham, Alexander and Beretania Avenue.
" " Alexander, Bingham, Artesian and Beretania.

TRACINGS.

Lualualei, Waianae, Oahu.
Lualualei, Waianae, Oahu. Reduction.
Portion of Pearl Harbor showing U. S. Naval Reservations.
South coast of Oahu.
Portion of Waiahole.
Compiled tracing Honokane and Waipio, Hawaii, showing watershed.
Smith, Johnston and Cornwallis Islands.
Lisiansky Island enlarged.
Coast line of Oahu.
Necker and Bird Islands, with soundings off same.
Layson Island enlarged and Niihau.
Also department published maps and prints of the Islands.
Waianae-uka, U. S. Army Reservation.
Kahauiki, U. S. Army Reservation.
Maunawili Ranch, Koolaupoko, Oahu.
Kailua, Koolaupoko, Oahu.

No. of maps, tracings and charts registered and filed .....143 Total 2124
No. of copies of surveys furnished.....187
No. of field books registered and filed 34
No. of tracings furnished (not including tracings and sketch plans attached to descriptions of surveys furnished) 175
No. of blue prints furnished 580
No. of reports and official letters 411

Special mention is made of the large map of the Island of

Hawaii which was completed by our chief draughtsman, Mr. John M. Donn. This map drawn to a scale of 10,000 feet to the inch, is the result of painstaking efforts of an able draftsman who made the best possible use of the mass of information on file in the office, which included some private surveys. Mr. Donn has nearly completed the compilation of the new map of Oahu. There will undoubtedly be quite a popular demand for this most excellent map for the reason that the original by Mr. Curtis J. Lyons, which is out of print, was unfortunately poorly reproduced by the publishers on a poor quality of paper.

Many changes have taken place since 1881 and the new map will show to some extent the agricultural development along the line of the Oahu Railway & Land Company's track.

The foregoing gives but a general idea of the routine work of the office, as there is much done in the way of checking old surveys and giving information on a great variety of matters relating to private and Government lands not referred to in the above items. As a general rule, all matters where land boundaries are in dispute require much time in careful study. We have in quite a few instances settled troublesome differences between the owners of lands where the Government was in a sense, an interested party.

Perhaps the most keenly contested case we have considered during the year was with lands in Waiahole, Oahu, adjoining Government remnants. The owners of Grants 2703, Lot 2, and 3939, Lot 1, submitted to us a considerable amount of evidence to establish the boundary between their lots after having, at the request of the Land Commissioner, signed a written agreement to abide by our decision. After all testimony was in and a decision reached, an assistant was directed to stake the bounds of the lands on the ground and to map the location for future reference.

Registered Map No. 2064, dated March, 1902, represents our decision in the matter.

HYDROGRAPHIC SURVEYS.

The U. S. S. "Albatross," Captain Chauncey Thomas, has

been engaged in these waters during the months of April, May and June, making soundings and dredgings that will be of great interest.

We have endeavored to assist in this work by furnishing copies of such maps and tracings of all the Islands as we have at hand. Captain Thomas will furnish this office with the results of the survey at an early date, which courtesy will be highly appreciated.

Some work has been done to bring the chart of Honolulu Harbor up to date.

A thorough survey of Kapua Entrance and approaches at Waikiki, South coast of Oahu, has been completed to facilitate the landing of the Pacific Cable. We desire to acknowledge many courtesies from Captain Hugh Rodman of the U. S. S. "Iroquois" for favors extended in connection with this somewhat dangerous surf work, which was done by Mr. F. E. Harvey.

METEOROLOGY, TIME AND TIDES.

As will be seen in Appendix 2, the Weather Service has been carried on during the past year under the efficient direction of Mr. Curtis J. Lyons, Territorial Meteorologist. Considering that our observer has no adjacent stations to report to him, his daily forecasts of weather conditions have been remarkably good, though he refers to his success in a modest way.

The local standard and Greenwich time has been obtained from transit observations and the steam whistle signal given as usual. It is to be hoped that we may in the near future secure a standard time-ball apparatus.

Honolulu is now an important shipping point and needs this improved time signal for navigators as well as for others.

The tide records for the last year show some disturbance and we look forward with interest for a report on the duplicate records furnished the Tidal Division of the U. S. Coast and Geodetic Survey.

TRANSFER OF PROPERTY TO THE U. S. COAST AND GEODETIC SURVEY.

On March 8th, acting under instructions received from the Superintendent of the U. S. Coast and Geodetic Survey, Prof. W. D. Alexander made a formal request for such property and records as were considered to properly belong to a Coast and Geodetic Survey.

In compliance with this request, we have transferred the 12-inch Transit which has been used solely for triangulation purposes, and something like ninety volumes of Reports, Scientific Works, Mathematical Tables, etc.

It was found impracticable to transfer any of our own records for the reason that the Geodetic and Land Surveys that have been made here in the past are so inextricably intermingled that they cannot be separated.

PLANS FOR FUTURE WORK.

The work for the coming year will be determined by the necessities of the case. The homestead surveys will be pushed rapidly and the city work will be advanced as opportunity offers. Among the lands to be cut up into homesteads may be named the following:

Puna Hawaii.

Olaa Homestead surveys now in hand to be completed.

South Hilo, Hawaii.

Forest reservation line to be established along the 2,100 ft. elevation, and a survey and map made of the Makai section, showing topographical and other features in order that the Land Commissioner may offer further clearing permits to agriculturists.

North Hilo, Hawaii.

Papaaloa, Kihalani, Hokumahoe, Manowaiopae, Puakeeo, Maanalulu, Kaiwilahilahi, Maulua-iki, Kaiakea and Kamaee.

Hamakua, Hawaii.

Manowaialee Remnant.

Kau, Hawaii.

Kiolakaa, Puumakaa and Puueo. 5,000 acres of the above is to be set apart for a forest reservation and the remainder laid out into homesteads.

South Kona, Hawaii.

Land of Alika.

North Kona, Hawaii.

Lands between Makaula and Ooma.

Maui.

Low lands of Wailua-nui.

STATEMENT OF EXPENDITURES AND RECEIPTS OF THE SURVEY DEPARTMENT FOR THE FISCAL YEAR, ENDED JUNE 30TH, 1902.

EXPENDITURES.

	Appropriated.	Drawn.	Balance.
Salary of Surveyor	$6,000 00	$3,000 00	$3,000 00
" Chief Assistant ...	5,000 00	2,500 00	2,500 00
" First Assistant	4,200 00	2,100 00	2,100 00
" Second Assistant ..	3,600 00	1,800 00	1,800 00
" Meteorologist	3,000 00	1,500 00	1,500 00
" Messenger	1,200 00	600 00	600 00
Expenses of Survey and Office Work	48,000 00	21,096 98	26,903 02
Publishing Maps	1,600 00	688 96	911 04
Meteorology	750 00	214 50	535 50
	$73,350 00	$33,500 44	$39,849 56

RECEIPTS.

Published Maps	$77 50
Tracings	57 50
Blue Prints	53 50
Rating Chronometers	17 50
Data furnished	32 00
	238 00

APPENDIX NO. 1.

REPORT UPON SURVEYS IN HILO AND PUNA DISTRICTS, HAWAII, H. T.

HILO, HAWAII, T. H., June 18, 1902.

TO THE GOVERNMENT SURVEYOR,

Territory of Hawaii.

SIR:—I wish to present the following report upon the survey work in the Hilo and Puna Districts on the Island of Hawaii.

This work has been mostly in the line of Homstead lot surveys in Puna, Hilo City work, and the completing and correcting of old Homestead Tract Surveys, also adjusting old lot lines to newly constructed roads.

As will be seen, considerable time of our force has been taken in finishing and correcting old Homestead Tract work as well as properly locating newly constructed roads. In the case of the Homestead Tract surveys, this work was supposed to be done at the time the surveys were made, and they were reported to be finished, but we have failed, in several instances, to find any trace of lines cut.

The new roads have been simply run on a grade and then constructed through our Homestead Tracts without any reference in their location to the lots, thereby involving upon us a vast amount of unnecessary expense and delay, which could have been saved if these roads had been properly located when they were first surveyed.

HILO CITY WORK.

Hilo's steady growth has necessitated considerable work in the way of city improvements and street work. Street lines have been given for Pitman Street extension into Puueo, Wharf Street from Front Street to the new wharf, Front Street from Hackfeld's Lumber Yard to Hoolulu Road Bridge Street restaked to a width of 60 feet, and maps and notes of surveys of all claims completed, Richardson Street from Volcano to Front Street, and Waianuenue Street from Hitchcock's to a point 800 feet Mauka. Grades have been given for Pitman street extension to Puueo, Wharf Street from Front to New Wharf, and for numerous small sections of fence and building lines on different streets.

Curb grades for sidewalks have been given on both sides of Waianuenue Street from Front Street to the upper side of the hospital grounds, on the Mauka side of Front Street from Waianuenue Street to King Street, and for several small sections on different streets.

Profiles have been run of Bridge St. extension from King Street to Volcano Street, Church Street from Front to School Street, and Richardson Street from Volcano to Front Street.

Preliminary plans were made for Pukihae Arch, and later on, plans for Pukihae and Alenaio bridge abutments were made, and the work staked out on the ground for the contractors.

During the latter part of 1901, a complete cross section and study was made of the Hilo City Water-head Reservation. The object was to protect the water supply springs from all contamination by a reservation that would cover all land that would have a drainage in or towards the springs, also in connection with this, a survey of 300 acres of the Piihonua forest land was made for exchange with the Hawaii Mill Co. for land taken for the Water-head Reservation. Both of these surveys took considerable time as the proposed Reservation and vicinity was covered with high cane and, in the forest survey, all lines had to be cut through a fairly dense forest.

During the month of November, 1901, there was a large rainfall in Hilo and vicinity resulting, on the tenth of the month, in the flooding of the Waiolama region and the breaking through of Front Street and washing out of part of Hackfeld's buildings and lumber yard.

We made a complete study of this region, also of the Alenaio freshet as far as Kaumana, measuring the flow of the canal and possible future freshets from this source, furnishing plans and report on same.

We are also making good progress in accurate city block calculations since the last report.

A map of Hilo and vicinity was compiled on a scale of two hundred feet to the inch, showing the present water pipes of the city.

Hilo City's accurate triangulation and reference point work has been extended to Kaumana and Kaiwiki. Work was commenced upon the traverse of the new Kaiwiki road.

The survey and plan, with proposed street system of the region east of Waiakea River, has been completed.

On Front Street from Church to Ponahawai Street and vicinity, a complete detailed survey has been made showing all buildings.

PUNA DISTRICT.

At Olaa, the survey of fourteen hundred acres in two hundred acre lots for the Kilauea Settlement Association at 29 miles and back of the Volcano Road, has been completed with the exception of marking the lot corners.

At 13 miles on the Volcano Road, three tracts have been surveyed for the Kaihenui, Lewis, and Nailima Settlement Associations upon which sections, every lot line has been cut, and substantial posts placed at each corner and the map and notes of survey of each lot are finished. This work has been done with the assistance of Thos. Cook, and under many difficulties owing to the heavy forest and the almost constant pouring rain during most of the field work operations.

At the Volcano, we verified very carefully with steel tape our former Volcano Road stadia traverse from Volcano House

Station. At 13 miles, we carried a very careful steel tape traverse of stations from Olaa Trig. Station to the 13 Mile Road and along 13 Mile Road to Keaau Boundary from which the surveys of the different lots were developed.

In the lower part of Puna, Mr. J. H. Moragne was employed from Sept. 4, 1901, to the middle of April, 1902, surveying the region from Kalapana and Kaimu to and including Kamaili, Malama and also the Nanawale region. This work was accomplished in good rapid time considering the nature of the country, which is mostly wooded and very rough, the mauka part of which lies in such a way that very little triangulation could be done. It became necessary to establish a few accurately located reference points first, which were located from the Kaimu-Kalapana Trig. Stations, and from these the new mauka Puna Road was accurately located from Kalapana to Pahoa Village, and traverses were made of the sections and pockets of good land, after which, plans of the lots were drawn and each lot laid out on the ground. Every lot line was cut through and substantial posts with piles of stones placed at every corner.

Almost all of the lots were laid out in compliance with the direct requests of intending applicants, and many of these lots are at present occupied and cultivated by those who wish them. The sections surveyed by Mr. Moragne are mapped as follows:

								Total Area.
Kiula Lots, containing	8	lots	from	5	to	16	acres each	89.68
Kaimu-Makena-Section	20	"	"	35	"	350	" "	1124.32
Kaimu-Kalapana-Uka	6	"	"	12	"	40	" "	146.69
Kikala-Keokea contg.	33	"	"	5	"	185	" "	1806.36
Keauohana-Kamaili "	24	"	"	11	"	80	" "	1009.26
Kaniahiku "	9	"	"	10	"	46	" "	223.10
Malama Section "	5	"	"	7	"	15	" "	50.90
Keonepoko-Iki Sec. "	23	"	"	5	"	10	" "	215.36
Oneloa-Ahalanui								999.00
Pahoa Village contg. 25 small lots 50 by 200 feet each								6.00

The total area laid out in lots is 5670.67 acres.

WORK IN HILO DISTRICT.

This has been in the near vicinity of Hilo City, and, as mentioned, has been mostly in the line of work that has been done and that should have been done before. Kaumana new road running diagonally through the lots of the Ponahawai Homestead Tract, has made it necessary for us to locate accurately this road with relation to the lots and to adjust the descriptions of the lots to the new road. We made a survey of this road as reported during 1900, but on attempting to adjust the same to the lot lines, as marked on the ground, found that they did not coincide within reasonable distances even, and, owing to numerous calls on other work, we had to drop this matter until the latter part of 1901, when we found time to thoroughly and accurately locate Kaumana Station and check our Kaumana Road traverse with same, which road traverse we found correct, showing that the former surveys of both the Kaumana and Ponahawai Lots contain many inaccuracies, the adjustment of which still remain a puzzle and a cause of delay in our work of making up descriptions for the issuance of Patents on lots upon which the conditions have been complied with.

Mr. Moragne, after completing his Puna work, has been employed in straightening out the Upper Maulua lots. I left with him on Monday, April 28, 1902, for Maulua, where we easily found the Puu Ohai and Haiku primary stations, and, with these we have triangulated two points at the upper line of the Waikaumalo lots, and from there have made several closed in traverses around part of the Upper Maulua lots, and have not found any of these lines cut through on said lots, as reported, and also find considerable differences in the described and actual coordinates of the lot-corner posts on the proposed Mauka Road as found and located on the ground. Moragne is now checking the work preparatory to running the lot lines upon the ground. This work though necessary, is unfortunate at this time and, with the adjustment of the lower lots to the new roads, will take a great deal of valuable time and expense.

WORK FINISHED AND TRACINGS FURNISHED.

Two tracings Waiolama Washout.
Two tracings of Hilo water works system.
Three tracings Hilo City water-head reservation.
Two tracings 300 acres Piihonua forest clearing.
Two tracings Front Street, Piopio section.
Two tracings Bridge Street extension and claims.
One tracing and six blue prints Pukihae Bridge abutments.
One tracing and three blue prints Alenaio Bridge abutments.
Two tracings Piihonua forest study.
One tracing of Hilo City, section east of Waiakea River.
Three tracings Kilauea Settlement Association lots.
Three tracings Kaihenui Settlement Association lots.
Three tracings Lewis Settlement Association lots.
Three tracings Nailima Settlement Association lots.
Three tracings Kiula lots.
Four tracings Kaimu-Makena section.
Four tracings Kaimu-Kalapana Mauka section.
Four tracings Kikala-Keokea section.
Four tracings Keauohana-Kamaili section.
Four tracings Kaniahiku-Malama section.
Three tracings Keonepoko section.
Three tracings Oneloa-Ahalanui section.
One map of Pahoa lots.
Two tracings Olaa Homestead Reservation Tract.

DESCRIPTIONS OF SURVEYS AND MAPS FURNISHED.

Kaihenui Settlement Association lots.
Lewis Settlement Association lots.
Kilauea Settlement Association lots.
Olaa Homestead Reservation Tract.
Kaumana Road and Ponahawai Adjusted lots.
Kehena lots, Sections 1 and 2.
Panaa lot.
Bridge Street extension street claims.
Front Street, Bishop Estate and Piopio claim.

In my work I have been ably assisted by Messrs. T. E. Cook, J. S. Janeway, J. H. Moragne and George Crow.

Respectfully submitted,

E. D. BALDWIN,

Assistant in charge of Hilo-Puna Surveys.

APPENDIX NO. 2.—METEOROLOGY AND TIDES.

SURVEY DEPARTMENT,

METEOROLOGICAL OFFICE, July 31, 1902.

SIR:—I have the honor to submit the following brief report of the work of this office during the year ending June 30th, 1902.

Records of daily rainfall have been received from about eighty stations, said records being made by voluntary observers, and the monthly totals published in Honolulu papers about the fifteenth of the succeeding month. About one-half of the rain-gauges required have been furnished by the Government, the other half being private property. Copper gauges are in a great measure replacing the older tin ones which are not lasting, and fresh measuring glasses are furnished in case of breakage.

Six observers are furnished with maximum and minimum thermometers, and one with mercurial barometer at Pepeekeo, Hilo. These observers report daily temperature, also direction of the wind and brief notes of the weather. Three observers also make daily observations of humidity and report thereon.

The observations at the central office at 1508 Alexander Street have been kept up and somewhat enlarged in scope, involving about thirty entries a day. This closes the nineteenth year of the series. The publication of these observations, as well as those at the out-stations, in permanent form, begins with the year 1892, and ends with the year 1898, this last having been published within the last twelve months.

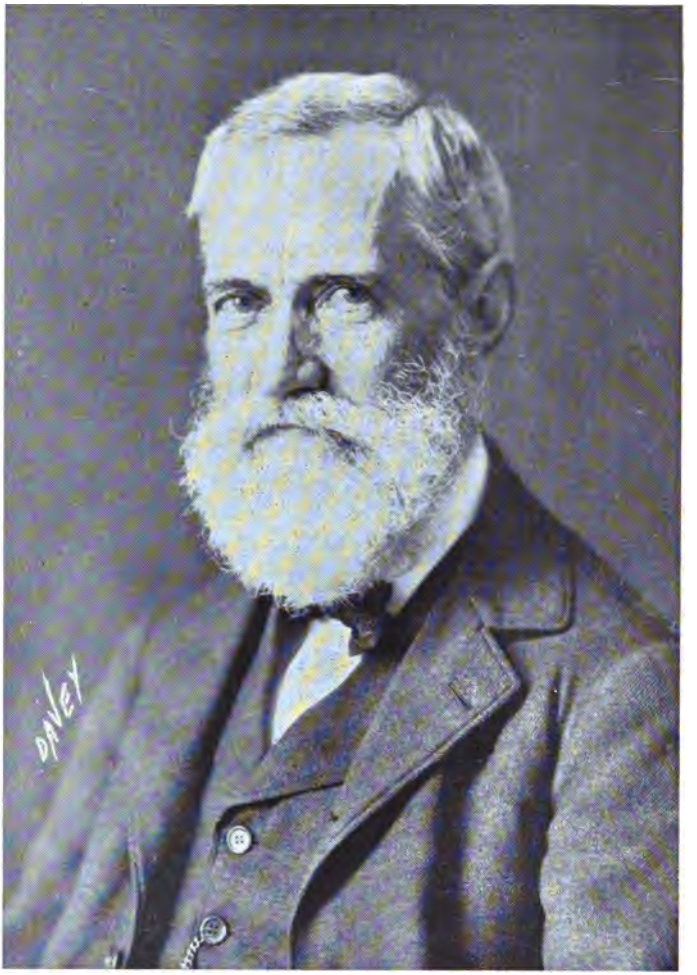
Every month a summary, including the averages and changes, and comparison with normal meteorological conditions is published in the local papers. This includes also the average temperature and other items from outside stations, especially the percentage of district rain-fall as compared with the normal.

The daily conditions of weather are telephoned to three daily papers, two evening papers and one morning paper. The latter has also furnished to it a forecast for the day which has proved in a measure successful. A weekly table is also published in the "Gazette."

A pamphlet is now in press giving the entire monthly rainfall of each station from the beginning of observation when such beginning was before 1897, and coming down to the close of 1900. In some cases this covers a period of twenty or more years. The table gives the normal average for each month of the year, and the average yearly rainfall for each station. As this table covers the entire group, it is hoped that it will be found very useful for the agricultural interests of the Territory.

The U. S. Monthly Weather Review, the organ of the Weather Bureau at Washington, publishes very full reports which are forwarded from here, and the editor has shown an especial interest in this station. The Hydrographic Office also receives reports from this office. Our published annual reports are sent to the leading observatories and weather offices abroad, and the publications received in exchange have built up an extensive library for this office which should be well cared for, for the benefit of future students.

The automatic tide-gauge in Honolulu Harbor is under the charge of this office and is in continuous service, this being one of the important stations of the world. Duplicates of the records have been sent to Washington up to April of this year, to the Tidal Division of the U. S. Coast and Geodetic Survey. The apparatus has been thoroughly overhauled of late and is in good order, but needs a new shelter house. Seismic waves are a special object of record, and a very interesting series has lately occurred. The mean sea level is also an especial



CURTIS J. LYONS.

matter of study, and has shown some remarkable variations in the last twelve months. The rising and falling of the water in our artesian well subterranean reservoir, is also noted.

The publication of annual reports is somewhat in arrears, partly from lack of force and partly from slowness of figure work in printing offices. It will be brought up to date as soon as possible.

Respectfully submitted,

CURTIS J. LYONS,

Territorial Meteorologist.

Hon. WALTER E. WALL,

Surveyor.

APPENDIX NO. 3.—THE HISTORY OF THE HAWAIIAN GOVERNMENT SURVEY.

The Government Survey of Hawaii has derived its main importance from its relation to the original land titles and to the public land system of the group. It owes its origin to the necessity of such a survey to the Government in dealing with its own lands. But as an organization it has been indispensable in many other lines, and has ever been hand in hand with all schemes for the development of the country, and has also had its share in the scientific work of the world.

To understand its inception and its legitimate objects, it will be necessary to dwell, briefly if possible, upon the land history and land conditions in Hawaii, and to repeat for the benefit of readers abroad many things already known to residents on the islands.

Civilization came to these islands to find an already existing land system, such as it was. What might be called "no man's land" did not exist here, and the peculiarly American term "taking up" land has practically no place here. The land was "taken up" probably a thousand years or more ago. The "ahupuaa" may be regarded as the primary division of Hawaiian land. Its typical form was a strip at right angles to the shore, with its fishery and sea beach, its cultivatable

land, and higher up, its forest. All with definite boundaries, and each with its specific name. A chief held it; not owned it, for he owed allegiance to a higher chief or the sovereign. He himself, in turn, had tenants beneath him, occupying with more or less permanence, owing him military service in time of war, and agriculture service in time of peace.

The sovereign therefore "owned" all; he dared not disposses his powerful tenants for fear of rebellion; but no one could give such a fee simple title as civilization demanded.

A general division took place in 1846-1849 under Kamehamaha III. The methods will not be given here, but the results were as follows:—

1. The king owned certain reserved lands, treated at first as private property, afterwards, in 1864, by Act of Legislature, signed of course by the then reigning king, heir of Kamehameha III., made inalienable public property known as "Crown Lands," whose revenues should ever thereafter go to the reigning sovereign's emolument.

2. The chiefs owned in fee simple the better portion of the lands formerly held by them in fief. Excepting however the kuleanas to be mentioned below.

3. Lands that were set aside to be "Government Lands," mostly such as were given up by the chiefs in order to acquire the complete title to those specified in No. 2.

4. "*Kuleanas.*" Kuleana is a Hawaiian word originally signifying an interest in either property or business enterprise schemes. It came in the time of the Land Commission to be applied universally to the fee simple holdings awarded to the common people. That is: in all the three classes of lands mentioned above, the sub-tenants were allowed in fee simple such separate small tracts within the limits of the ahupuaa as they had previously improved or lived upon. There were about 11,000 of these titles, many of them covering two or more separate lots.

5. After the lands mentioned in No. 3 above were set aside, portions of them were sold to individuals at what was really a nominal figure, generally to native inhabitants of the lands, or to foreigners who had already made their home in

the country. These were covered by Royal Patents which are now called *Grants*. At the inception of the Government Survey there were about 3,000 of these.

A rough estimate would give about 2,000 Ahupuaas in the group. Many of these have subdivisions termed "*Ilis*." The "ili" often had a different owner from that of the ahupuaa in which it was situated.

We have therefore Crown Lands, Chiefs' Lands, Government Lands, Kuleanas and Grants. The initials L. C. A., Land Commission Award, apply to all lands, kuleanas or ahupuaas, or "ilis," which were awarded by the Land Commission between 1848 and 1855. These are the main features of the land system, many details of which are omitted here for lack of space.

Now as to boundaries. The Kuleanas were awarded and the Grants were all made by surveyed descriptions incorporated in the titles given. These surveys were all magnetic surveys, and were made each on its own basis, giving generally the names of adjacent owners or of adjacent Ahupuaas and ilis. Practically there were absolutely no general surveys, although there were a few sections where the kuleanas were plotted together in their relations to each other.

For the sake of getting a speedy issue of titles it was necessary to make the surveys as cheaply as possible. Men of intelligence and capacity able to measure around a lot with compass and chain were employed to survey the kuleanas at two or three dollars a claim, also two or three professional surveyors. There were no workmen competent to make general surveys nor means to pay such workmen. The boundaries of the ahupuaas were often very crooked and irregular, in many cases, gulches.

Some of the chiefs had their lands surveyed and received awards by survey, but the majority of the ahupuaas were awarded simply by name, with the understanding that ancient boundaries should be preserved. Some were surveyed after award.

The consequence of all this was that about 1868-1870 when there was a demand for additional grants of land, the Gov-

ernment was paralyzed by an absolute ignorance of the location and amount of what was left available. The lack of maps was also apparent in other directions.

The Government was in the habit of paying a small annual stipend ($400) to a native surveyor who was acquainted with the lands around Honolulu, who rendered assistance when wanted. In the Legislative Session of 1868, a member who had not then the slightest personal interest in the matter, (the writer of this article) moved that the appropriation be increased to $3,000 for the two years for the purpose of beginning a general survey. The amount was voted, but nothing was done about it in that biennial period. But the idea took root in the mind of the then Minister of the Interior, Dr. Ferdinand W. Hutchinson, who had by law the care of the public lands, and who had authority by the wording of the law to have them surveyed when necessary. Minister Hutchinson accordingly asked the Legislature of 1870 for $5,000 for "Government Surveying" for the Biennial Period, which was granted. In the course of the year he appointed William D. Alexander, then president of Oahu College, Surveyor-General. Professor Alexander had, during the year, executed a number of surveys on the Island of Maui, including that of the crater of Haleakala, which latter survey is well known, and being a thoroughly educated man was in touch with scientists abroad. The aforesaid writer of this article was taken as assistant, having had experience in Kuleana, Grant and Ahupuaa surveying in the time of the Land Commission. When the work began in 1871 two young men just out of Oahu College, J. F. Brown and J. M. Lydgate were taken on the staff.

The primary object of the Survey therefore was to account for all the land in the Kingdom by its original title, and indicate such accounting on general maps, and while having no authority to settle boundaries, to require the surveyors to lay down such boundaries on maps to the best of their ability with the abundant information at their disposal. This was the only means of enabling the Government to know what it possessed. The subsequent history of the country has shown

the wisdom of the course, and the fact that these maps, free as they have been to consultation by the public, have been of infinite use to the said public, is the reason why money has always been forthcoming from the public revenues.

To accomplish the object several things were necessary. First, to execute such a triangulation of the country as is now well known to be the foundation of every good general survey, furnishing points by which to connect together correctly all work, whether cadastral or boundary work; also topographical work, hydrographic work and engineering work. To make a reliable, or in any way general map by patching together a number of individual title maps is simply impossible.

Second, to put in the amount of topography necessary to identify localities and land limits.

Third, to copy in shape for practical use the individual kuleana surveys of each district to be surveyed, also the surveys of Grants. These were indiscriminately contained in large volumes, and were only to be found by means of indexes. It was necessary for a party going into a district to have for use a book containing all the kuleana surveys of said district, arranged according to lands, another containing all Grants, and another still of Ahupuaas or ilis that had been surveyed. It was the task to fit these in place by means of the controlling triangulation. This would practically show the location and limits of Government lands remaining.

While the old "spot surveys" had served their purpose of enabling titles to be acquired, and while the majority of them had been made by conscientious and intelligent men, still the crudeness of cheap work, and the faulty methods, and the lack of uniformity, made the task of locating these surveys in proper places a difficult one. It is true also that there had been two or three Land Commission and Government sale employees who were outrageously incompetent, and whose work has made an infinite amount of trouble.

The logical order of conducting a survey of the character of this, the newly established one, would be as follows:—

First, to establish the exact latitude and longitude of an initial station.

Second, to measure a base-line or lines, and extend from such base or bases a chain and net-work of primary stations over the whole group, forming one system. (It must be borne in mind that the base-line of a triangulation has nothing in common with the base-lines of the United States national public land system). To illustrate, on the island of Oahu, Diamond Head, Punchbowl Hill, Tantalus, and Konahuanui and Makapuu Pt. are all primary stations. They form a part of a chain of consecutively established points, which extends not only around this island, but also continues through the group to Hawaii. They are primary in relation to the work here, but correspond in scale and accuracy of determination with secondary points on the mainland. They are all established by their latitudes and longitudes down to a single foot, and also by their exact distance and direction from each other.

The next step logically is to establish secondary stations dependent on these, in groups surrounding these, and generally recorded by northing and southing, easting and westing from a near primary station.

Next in order is to survey the land topographically, starting the work from these stations as a sub-frame work, entering especially coast lines, roads, hills, gulches, fences, houses, monuments and any other object likely to be useful in locating land boundaries.

Lastly, to take up the old title surveys, establish some of the corners on the gronud and fit them in on the map to the best of the ability of the surveyor in charge, which last means a great deal. Good judgment and experience on the part of the surveyor in this means far more than technical skill, and then later on the work should be subjected to the opinion of the best expert in the office.

The boundaries of the Government Tracts should then be thoroughly delimited along lines of private ownership.

This ideal programme, however, is very unlikely of fulfillment. It is always necessary, in matters of this kind, not

only to placate the public by producing maps at an early date, but to meet real needs of public business.

The newly appointed Surveyor-General placed himself in communication with the U. S. Coast Survey. The officers of this bureau were extremely courteous, and loaned to the Hawaiian Survey a high class base-line apparatus and other instruments. The methods of the Coast Survey, also of the British Ordinance Survey, the Great Indian Survey and the Australian and New Zealand Surveys were studied for suggestive guidance in this work.

It was decided for various reasons to begin work on the island of Maui. Accordingly after some time spent in selecting a level site for base-line, a number of stations for triangulation were established, including the summit of Haleakala and also that of Kahoolawe Island. The actual measurement of the four-mile base was begun on the 18th of August, 1871. It was located on the Maui Isthmus and extended from near Kahului towards Maalaea Bay. The apparatus consisted of two four-metre bars of iron enclosed in pine scantling, supported by tripods, and furnished with thermometers to determine the temperature correction, and with graduated levels to determine the slope correction for each bar setting. It may be noted that while the 4-mile line was probably correctly measured within an inch, the temperature correction alone amounted to about seven feet. It was a slow and tedious job, the "contracts" being made with a magnifier and the bars lined in with a transit, the whole field work requiring three weeks, the services of four skilled men and three or four laborers. The "bar" method has been superseded in later years by the use of 200 or 300-foot steel tapes, this method however being only successful in cloudy weather on account of unequal heating of the tape by the sun in clear weather. Calm weather is also essential for tape work.

The justification for the expense of measuring a base line with such extreme accuracy lies in the fact that it is done once for all, and the exact length is likely to be required in after years, not only for the ordinary needs of boundary

work, but for the most critical demands of science and of engineering.

To explain the bearing of this statement it is necessary to explain the meaning of the term triangulation. In this method of work after the exact length of a base-line is determined, its ends of course being visible from each other, the elevation of each extremity above the mean sea-level, the exact direction (azimuth) of one end from the other, and the exact latitude and longitude of each end are all ascertained. A prominent point is then selected, generally on a hill top, whose exact direction from each end of the base is ascertained, and the exact angle that this direction makes with the base-line. The distance of the precise point of intersection of these two lines of direction can be calculated. This calculation not only determines the position of the new point but furnishes two new base lines, so to say, with which to determine by the same method other points beyond. Thus the chain of points goes on and it is needless to say that the correctness of the whole work depends upon that of the base-line measurement.

During the winter of 1871-72 this triangulation was carried on over the central portion of Maui. A fine 12-inch theodolite by Troughton & Simms of London, reading to seconds of arc, arrived meanwhile, and has been the mainstay of this character of work ever since. The work for the season extended to the summit of Haleakala, whose height was then ascertained, and to the highest hill on Kahoolawe.

It was then decided to make a detailed survey of a district in order to exhibit to the coming Legislature the scope of the work, as well as to gain experience and establish precedents in what was then an untried undertaking. Accordingly Makawao with the neighboring region was selected, and the whole force was employed there from March till June, 1872, the map which was also drawn there being the pioneer map of the Survey. A sketch map showing all the executed and projected primary triangulation of Maui, Lanai, Molokai and Kahoolawe was also made, and the great errors

of the existing chart of Maui, shortening the island about ten miles were demonstrated.

Returning to Honolulu, the entire party in the early fall took up the matter of an Oahu base-line. For convenience this was chosen nearly along the Northeast line of King Street from a point east of Thomas Square out to the slight rise near the Moiliili Church, being something over 10,000 feet in length, and at that time over an entirely open country. The measurement occupied about two weeks, a portion being re-measured in order to judge of the accuracy of the whole, which was deemed to be within about one in 250,000 of the actual length. That is to say, the probable error was deemed to be not more than a third of an inch.

In connection with this base a series of exact levels were run from the foot of Nuuanu Street where an assumed mean sea-level was taken, out to the base-line and over its entire length. A bench-mark established on this line of levels on the front of the present Judiciary Building has been the standard of all city work ever since. Another necessary step was the ascertaining of the exact azimuth or angle made with the true meridian by the base-line. This determination harmonized within two seconds of arc with the meridian by the Transit of Venus party of 1874.

The triangulation of South Oahu was immediately taken up, Tantalus, Diamond Head and other points around by Mokapu Point in Kaneohe being observed on and the positions calculated. As the east end of the Oahu base-line has been lost, the distance between the Tantalus and Diamond Head Stations may be said to remain as the standard for length for all work on the island. The heights of all these points were carefully ascertained.

The next step in the winter of 1872-73 was to measure a base-line for the Island of Hawaii. This was located on the Puukapu plain in Waimea, 2,800 feet above the sea, and about 13,000 feet in length. The triangulation in the neighboring region executed at that time extended to the summits of Mauna Kea and Hualalai and to Puu Loa above Kawaihae. A line of levels also connected the Hawaii base with the sea.

The foundation was now laid for the work in the three greater divisions of the group.

The party then returned to Honolulu, with the exception of Mr. Brown, who entered upon private work. The matter of cession of Puuloa or Pearl Harbor to the United States had just come up for action and a survey was ordered. The main triangulation was extended to that part of the island, secondary triangles for the harbor measured, and the shore lines run in with great care by the plane table, making a basic map of said harbor which has been the foundation of all the later work. The U. S. Coast Survey experts, Lieuts. Sands, Cutting and Wilson, executed the soundings for the bar; the map was completed in June, 1873. Mr. Lydgate left the survey at this time to enter upon private work on Crown Land and other boundaries on Hawaii.

The work of compilation of lists of lands giving titles and location, now devolved upon the Surveyor-General, and the results have always made this office a source of information.

During the period 1873-77, the following objects were attained:—By Professor Alexander, the triangulation of the Island of Oahu was completed, the whole of Waianae and Central Oahu surveyed; the country between Honolulu and Manoa known as the Makiki District was surveyed, and, as mentioned above, lists of lands and titles perfected. Oahu was connected to Molokai by heliograph triangles, and longitudes and azimuths were compared by the data furnished by the British Transit of Venus expedition which came to Honolulu in the winter of 1874-75. By C. J. Lyons, coast line surveyed from Waialae to beyond Pearl Harbor, also the upper part of Nuuanu Valley; the first general map of the group since the days of Commodore Wilkes was compiled from all sources of information at hand, a finished copy of this being sent to the Philadelphia Centennial. The map was also published by the Board of Education as a wall map. A map was also made of the Island of Oahu on the scale of 5,000 feet or nearly a mile to the inch. This, too, was dated 1876. Unfortunately it was not published in first-class form. These maps showed the

previous charts to be quite incorrect in outline. There was the Cook-Vancouver map, then the "Mission Map" published at Lahainaluna in 1836, which is very valuable as being made with assistance of Hawaiians, and so preserving correctly the old names, and the Wilkes Expedition Map of 1841. Each had its own excellencies and errors, the last mentioned being no better than the others, and having some parts of coast line ten miles out of position.

In 1876 a detailed survey of Kaneohe was executed by Mr. Lyons, the question of Crown and Government Ilis inside of an ahupuaa that had been awarded by name coming up in this connection, and being ultimately referred to the Supreme Court for decision. It is almost needless but important to say that the Court accepted the existence of such titles within titles, as a part of the system as handed down.

In 1877 a renewed period of activity was inaugurated. Taking Mr. F. S. Dodge as assistant, Prof. Alexander not only carried out the triangulation of the larger portion of East Maui, but executed the detail maps of the districts on East Maui known as Hamakualoa, Koolau and Hana, all rough districts with rugged coast-line, and including Haleakala Mountain. At the same time Mr. Lyons took up the survey of North Hawaii, co-operating with Professor Alexander in connecting by heliograph the triangulation of North Hawaii with that of Maui, by means of the stations Haleakala on Maui, Moaula on Kahoolawe, Puuloa and Puako on Hawaii, the nearest distance being about 68 miles. The Hawaii triangulation was then carried from Puuloa near Kawaihae to Hilo, over Mauna Kea and through Hamakua and Hilo districts. A general reconnaissance of boundaries in South Kohala, Hamakua and Hilo, including the Mauna Kea and Mauna Loa regions were made, and the entire Hilo coast-line and road-line surveyed. This party returned to Honolulu in 1878. Mr. J. S. Emerson joined the Survey at that time and in 1880-81 executed a detailed survey of the valley of Waipio, Hawaii, which involved a large amount of work on account of the titles to kuleanas, and of Ilis that were not a part of the main title. Mr. S. E. Bishop, a good mathematical schol-

ar and previously principal of Lahainaluna High School undertook in 1880-81 the survey of Waikiki, i. e., the district between Honolulu and Diamond Head. As there are about six hundred different kuleana lots, with numerous Grants and Ilis, and as proximity to the town of Honolulu necessitated careful work, this was a tedious job, but the results have been absolutely indispensable to public as well as private interests. In all work of this kind the method has been followed of mapping all natural and artificial features and fitting in the old surveys, all on the basis of triangulation.

During 1878 a compiled map of the Island of Kauai was made by Mr. C. S. Kittredge. A large portion of the Ahupuaas had been surveyed as to their external boundaries, for settlement of such boundaries. With the "control" of what may be termed a reconnaissance triangulation executed by Mr. J. F. Brown, a map on a 5,000 foot to the inch scale was secured, which has done good service. On account of the small amount of the then Government land remaining on Kauai, and of the fact that the Island is more entirely taken in hand by the owners, notably plantation people, there has not been the need of Government survey work there which there has been on the other islands.

During this priod Professor Alexander completed the triangulation of the Maui group, connecting Maui, Lanai and Molokai with Oahu. A good deal of work was done adjusting large land surveys in Hilo. Mr. Lydgate returned to the Government Survey work and carried out the general survey of Hamakua and Kohala districts on Hawaii. Mr. W. A. Wall, becoming a pupil in the Survey Office was soon capable of undertaking a draughtsman's work, and based on the work of Messrs. Lyons and Lydgate, produced under superintendence a series of maps extending from Hilo Town through Hilo, and all the Hamakua and South Kohala districts, mostly on a uniform scale of 1,000 feet to the inch, which have been of inestimable use in the development of the sugar industry and later of the homestead enterprise in that section.

Mr. J. S. Emerson, in 1882, undertook the triangulation of the west section of Hawaii from Kawaihae southward, and

it may be said in advance that he has borne the entire responsibility of that arduous country, taking in Mt. Hualalai and Mauna Loa, and around through the districts of Kau and Puna, completing with the supplementary assistance of a section by M. D. Monsarrat, in E. Kau and of E. D. Baldwin's work near Hilo and in Puna, the entire circuit of triangles around the island. This circuit includes of course the work already done in North Hawaii. The lands in Kona and Kau were located, the Grants mostly plotted in on a 2,000 foot scale, all the main features of the coast were put in, although the detail which would be possible with a 500 feet to the inch scale was not undertaken.

Mr. S. E. Bishop, in 1883, carried a minor triangulation around the northern part of West Maui and surveyed in detail the entire coast, putting in the land intersections and a good deal of topography. The Island of Lanai was surveyed in 1877-78 by Messrs. J. F. Brown and M. D. Monsarrat, and a map of it made on a scale of 2,000 feet to the inch.

Mr. M. D. Monsarrat was employed to take in hand the entire Island of Molokai. This survey was taken up in 1885 and continued at intervals till the year 1895 saw the work completed. A series of maps was made on the scales of 1,000 and 500 feet to the inch, covering the whole island, excepting the west peninsula, this latter portion being drawn on a scale of 2,000 feet to the inch.

The district of Kula, Maui, had been previously surveyed by Professor Alexander and M. D. Monsarrat in 1880. Honuaula and neighborhood aws surveyed partly by F. S. Dodge, and the remainder in 1883 by E. D. Baldwin, who had, as it were, grown up in the survey and had also surveyed Manoa Valley, a very minutely sub-divided tract near Honolulu. A heavy undertaking was the survey of Lahaina district in Maui, by S. E. Bishop, the map exhibiting a labyrinth of lines equal to any in existence.

In 1890 then the area of the whole group had been pretty well elaborated on paper, and information was ready for all inquirers. It is of course impossible in this article to give more details than the above.

The general map of the Island of Maui was executed by F. S. Dodge in 1885, and was published in good style by Julius Bien, of New York, scale 1.60000, or 5,000 feet to the inch.

The work of the Survey during the decade just passed, 1890-1900 has been very largely surveys of homestead tracts, and other public land sub-divisions, re-surveys of tracts that needed much more minute owrk than was at first possible, and the carrying out of a very important department of work, viz.: the city survey of Honolulu.

This last began in 1880 with a traverse of all the then streets by Professor Alexander. Then, beginning in 1881, Mr. J. F. Brown made block surveys showing principal sub-divisions and titles. Then about 1884 the present system of what is known as "rectangular co-ordinate surveying" of the city was adopted, and was carried out mostly by Mr. F. S. Dodge and later by W. E. Wall. The triangulation station on Punchbowl Hill (in the city) was taken as a centre in the same way that the intersection of the Greenwich Meridian and the Equator are taken in Geography, and all points in town and in the harbor, and on the bar have been referred to it by northing and southing, easting and westing, giving an absolute as well as relative location. The same method is now used in country districts, taking a neighboring important "trig." station as a centre in each case, which point is termed the "origin of co-ordinates" for that district. A minor triangulation of great accuracy, based upon the primary triangulation controlled the entire city and harbor, giving a complete check for traverses.

New maps on the scale of 20 feet to the inch were made of the business and central portions of the town, showing every building, and by colors the limits of the original awards, which were generally very irregular. The streets in the older part of the city, it should be remarked here, were not "laid out" strictly speaking. They were simply put through a village mostly of grass huts before there was a surveyor on the islands. When the surveys for titles were made each lot was surveyed just as fenced, without any attempt to rectify street lines, which in fact did not exist. This fact will explain much

about these matters, which later comers may not understand.

This city work mostly carried on by Mr. W. E. Wall, or under his supervision, has taken much of the time of the Survey during the past few years on account of the rapid extension of city improvements, and of the number and variety of land exchanges and transfers necessary on the part of the Government. Honolulu is probably as thoroughly surveyed a city as one will often find.

The Survey has been the main stand-by in all matters of scientific precision. Very shortly after its inception, enough tide measurements were made with a home-made tide gauge to determine the general law of the tides, and in 1880 a self-registering tide-gauge was loaned by the U. S. Coast Survey, which was set up in Honolulu Harbor and kept record for some years. A more modern instrument by Hugo Bilgram was procured and set up in a thorough-going style in 1891. From its record the tide predictions of the Coast Survey Tables are derived, careful records are made of the changes in mean sea level, and any earthquake waves or other deep sea disturbances that come to these shores are noted.

In 1882 the bureau took charge of the Government time for the town, with the equipment of the 12-inch theodolite and a chronometer. In 1886 a Molyneux astronomical clock and an astronomical transit, both of which were brought to Honolulu in 1846, imported at that time by G. H. Boardman for regulating chronometers, principally for the whaling fleet, were purchased by the Survey, and an observatory for time purposes was established, since which period all time determinations have emanated from the Survey Office. Chronometers have been rated in default of any private practitioner in the business up to a late date.

In 1885 advantage was taken of the fine chronometers of the steamers Mariposa and Alameda, on repeated round trips, to compare time with the Coast Survey time at San Francisco. The result practically agreed with that of the work of the British and French astronomers, Tupman and Fleuriais, and Honolulu has thus been made a standard port for the Pacific Ocean. In February, 1896, standard time was established

here, based on the meridian of 10 hours, 30 minutes slow of Greenwich (157° 30′), which meridian is central to the group. This was proposed here and was accepted by the U. S. Coast Survey.

Professor Alexander, in 1884, represented Hawaii in the International Conference at Washington, which adopted Greenwich as the initial point of longitude.

A Meteorological service gradually grew into existence in 1882 and succeeding years, in 1900 initiating regular rainfall reports, and which is acting in conjunction with Meteorological work abroad.

The necessity of a latitude standard for the group was soon apparent in the course of the Survey. For instance, the latitudes deduced from observation of stars at the north end and at the south end of an island would be found to differ from each other by a fixed amount, say ten miles. But by actual measurement, triangulated, the difference would be say half a mile less. The error of the first difference is owing to the plumb-line, or which is the same thing, the spirit in a spirit-level, being attracted by the mass of the mountain between the two stations, which fact affects the observed altitude of the sun or star from which the latitude is determined. This "deflection of the vertical" is particularly large on these islands.

Professor E. D. Preston of the U. S. Coast Survey was invited to assist in this as well as other lines of research. Three different visits by this assiduous scientist in 1883, 1887, 1892, were devoted to latitude observations, pendulum observations for determining the force of gravity, and to mabnetic observations for declination, dip, and force of magnetism. With Prof. Alexander and Mr. W. E. Wall, the ascent was made of Haleakala and Mauna Kea, and these and many other stations were occupied on this work. As the work of the Survey is done upon a true meridian, the comparison of this with the magnetic bearings at hundreds of stations had already given the magnetic declination and annual change, but a standard character was given to the matter by this work, and a basis for future comparison. The average dis-

placement of the vertical at the coast of the larger islands was found to be nearly half a minute, which would cause nearly half a mile of error in either latitude or longitude as the case might be, and also affects nearly all altitudes of our mountains.

The office work of the Survey has consisted, besides the making of maps by the assistants, who have executed the field work, of the arranging and general organizing of all records, which are very numerous and of many kinds, and of the searching for and giving information of all kinds to inquiring parties. These are landowners, prospective purchasers, private surveyors and departments of government, principally the Interior Office, now Public Works. Also the giving of assistance generally within the scope of the bureau, which is, as has been seen, has been a wide one. It has been so that the humblest holder of a kuleana from any part of the group could be freely informed on questions pertaining to his lines and original titles. No charge has been made for this. Visitors from abroad have been numerous, many of them in high scientific positions, navigators and navy officers of all grades being frequent callers. The systematizing of field notes and calculations, and giving uniformity to map work has been an important matter.

Mr. Lyons was in charge of the office from 1879 to 1896, and with increasing years is now mostly content with meteorological work. Mr. F. S. Dodge has probably produced the greatest number of elegant maps, but comparisons in this matter would be invidious.

The Survey has never been in a position to enter extensively into the very interesting hydrographic work that surrounds this group of islands. But from 1881 to 1884, Captain George E. Gresley Jackson, holding the position in the British Navy of Navigating Lieutenant, retired, was employed to survey the different harbors of the group. Having had experience in Marine Suveying these maps are as full and accurate as was consistent with the means at disposal, and have been very useful. There are about twenty-five of the series, and

most of them have been published by the U. S. Hydrographic Office.

There are now over 2,000 maps on file in this office. Many are old maps of historical value as well as legal. Survey maps proper vary from a plot of a section of a street to district maps involving thousands of dollars worth of work in the production. The standard sizes of survey maps (when rules are observed) are 28 x 36 and 36 x 58 inches. The usual scales are on the one, two and five divisions, i. e., 20, 50, 100, 200, 500, and 1,000, and so on feet to the inch. It has been deemed best to keep in touch with the average intelligent mind in the matter. For the same reason the unit of measurement has been the foot. After due consideration it was decided at the outset not to use the metre except in the base-line measurement, and experience has shown the wisdom of the decision. The reduction of chains and links on the old surveys to feet has been a burden, but one cheerfully borne. No Magnetic lines have been allowed in new work, all being referred to the true meridian. But the work of putting in old magnetic lines of infinite number and crookedness has been hereculean.

Mr. E. D. Baldwin, after producing a fine map of Honolulu, surveying the districts of Kipahulu and Kaupo on Maui, also a number of homestead tracts on Maui, was detailed to take charge of all work in Hilo Town and Puna district, and has remained in that capacity for over ten years.

Mr. J. F. Brown left the Survey in 1886 to take charge of the public lands, and remained in that department up to 1901.

Mr. F. S. Dodge, after carrying the heaviest part of the city surveying for a long period, resigned in 1899 to take charge of the Bishop Estate lands.

Of later workmen, Mr. S. M. Kanakanui, a full-blooded Hawaiian, has executed a large amount of first-class detail work in field and office, and also has accomplished a good deal in reduction and compilation of maps, notably in North Kohala.

Christopher J. Willis, of partly Hawaiian descent, learned in the office, and became an accomplished draughtsman. Of his work the present published map of Molokai is a good specimen.

Mr. O. L. Sorenson, after working for some time in the Public Lands Office, came into the Survey Office in 1898, and has been mostly employed on city work, and is now assistant in charge of office.

A great deal of valuable material has been obtained by men trained in the office and familiar with Government Survey methods, who, leaving the office, have been employed by plantation owners and other large land owners to make detailed maps, copies of which have generally been freely furnished to the Survey.

The first published Survey map of the Island of Hawaii was drawn by W. A. Wall, under direction of C. J. Lyons, scale 20,000 feet to the inch, or 1:240,000. It has been a handy map for general purposes for its small size. Mr. J. M. Donn of the U. S. Coast Survey, has lately been in the employ of the office, and has produced an elaborate contour map of Hawaii, scale 1:120,000, showing all ahupuaas, which has been printed in good style by Julius Bien of New York.

The accuracy of the triangulation work has been thoroughly tested. The circuit of Oahu by the series of triangles that made it, measures about 100 miles. The error of closure by Professor Alexander's work was about ten feet, or a tenth of a foot in a mile. A series of triangles mostly by a six-inch theodolite, was carried by Mr. Lyons from the Waimea base on Hawaii to Hilo, and a line of this triangulation extending across Hilo Bay, whose length was also derived from a measured line on the beach, was taken as a test line. The discrepancy of the two determinations was two-tenths of a foot in two miles. The average degree of accuracy of the triangulation may be placed as having an error of not more than 1 in 50,000. When we come to detail work there are two grades, the one the new work, which is intended as technically accurate, the other is of old work plotted in as best it can be from old notes of survey, and also of topographic detail, which is correct enough for general information, but is not minutely accurate.

The latest and most important change in the personnel of the Survey has been the resignation of Professor Alexander

to take a position in the U. S. Coast and Geodetic Survey. This took place in February, 1901, after thirty years of continuous and faithful service. Mr. Walter E. Wall took his place as Territorial Surveyor, which office, by the Organic Act, succeeded to the office of Surveyor-General.

CURTIS J. LYONS.

June 5, 1902.

APPENDIX NO. 4.—LAND MATTERS IN HAWAII, NO. 1.

BY CURTIS J. LYONS.

NOTE.

The following papers were written in 1874 in rather a colloquial style, and published in numbers in the "Islander," a Honolulu monthly of that year. As the use of the magnetic compass was quite general in those days, there being no surveyor's transits to speak of outside of the Government Survey, especial regard was had to that style of work in the chapters on surveying matters. Hence those chapters will seem quite antiquated to the present day surveyor. However it is hoped that they will be found always useful to those who have to retrace old magnetic lines, as the older lines always were, and that the whole series will be useful to those who, for the first time come to deal with our somewhat complicated system of land division and title.

Honolulu, July, 1902.

The change from barbarism to civilization that has taken place on these Islands has in no respect had more material importance than as regards land matters. A more generally diffused understanding of some subjects connected with these matters may tend to benefit the community, especially as it may enable some to comprehend and grapple with certain difficulties that are universally felt to exist, and which, however, seem to be beyond the combined skill and executive ability of any one individual to remove.

The particular kind of civilization that took root on Hawaii was not of the kind that destroyed all that preceded it. It might have crushed out all ancient vested rights, ignored ancient sub-divisions of land, and created a *carte blanche* upon which to begin *de novo* the marking out and mapping off of real estate; possibly endeavoring to introduce the monotonous rectangles of a United States public survey among the valleys and ridges of this diversified country.

Such a civilization would have treated the Hawaiian language as too paltry to put into print. Yet sometimes one is tempted to wish that not quite so much deference had been paid to the conservative side of the question. More of this hereafter.

The ancient divisions of land will therefore be our first subject to attend to. These Islands were, if the phrase may be allowed, tremendously peopled in many portions thereof. I can think of no word to express the swarming state of population that must have existed in localities. Even had Captain Cooke made no estimate, the evidences of such population are unmistakable. On general principles there must have been an inevitable diminution of the people with the advent of civilization, from the simple fact that the resources of the country would not support those same people as soon as their wants were increased. They were already industrious—what more could they raise from the soil, or furnish any way save as they pandered to vice, in return for the accoutrements of a new civilization. These are pertinent reasonings; certainly so to those who moralize on the diminution of races, though to follow them out would be a digression from our present subject.

Consequences of a long occupancy of the soil by a dense population—minute subdivision of land, and nomenclature thereof. Every piece of land had its name, as individual and characteristic as that of its cultivation.

The *unit* of land, so to speak, seems to have been the *Ahupuaa*. Its name is derived from the Ahu or Altar (literally, pile, *kuahu* being the specific term for altar) which was erected at the point where the boundary of the land was

intersected by the main road, *alaloa*, which circumferented each of the islands. Upon this altar at the annual progress of the *akua makahiki* (year-god) was deposited the tax paid by the land whose boundary it marked, and also an image of a hog, *puaa*, carved out of kukui wood and stained with red ochre. How long this was left on the altar I do not know, but from this came the name, ahupuaa, of the pile of stones, whiich title as given also to the division of land marked thereby. Many a time have I set up compass on ancient land marks of this sort, especially on Hawaii. One near Honolulu may still be seen on the north external slope of the crater of Salt Lake. This, besides marking the boundary of Halawa and Moanalua, marked also the limits of the Kona and Ewa Districts.

Near by I picked up an ancient ulu maika, the rolling stone of the bowling game of maika. The more common name of the altar on the Island of Oahu was *kaananiau.*

The Ahupuaa ran from the sea to the mountain, theoretically. That is to say the central idea of the Hawaiian division of land was emphatically central, or rather radial. Hawaiian life vibrated from uka, mountain, whence came wood, kapa, for clothing, *olona*, for fish-line, ti-leaf for wrapping paper, *ie* for ratan lashing, wild birds for food, to the *kai;* sea, whence came *ia*, fish, and all connected therewith. *Mauka* and *makai* are therefore fundamental ideas to the native of an island. Land as we shall see in a subsequent article was divided accordingly.

NO. 2.

In a previous article we have seen that the old Hawaiian system of dividing lands was preserved under the new system of titles; that in populous portions the subdivision was very minute, and that the main idea of the Ahupuaa, or primary division, was to run a strip from the shore to the summit of the mountain, in order to give an equitable share of all the different products of the soil and sea.

The Ahupuaa, however, was by no means any measure of area, as it varied in size from one hundred to one hundred

thousand acres, and on the almost worthless wastes of interior Hawaii attained to an even greater extent than this. Taking the above mentioned island first in order, the common ahupuaa is found to be a strip say of 1,000 feet average width, and running from the sea shore, not by any means to the top of the mountain, but to the zone of timber land that generally exists between the 1,700 feet and 5,000 feet line of elevation. The ordinary ahupuaa extends from half a mile to a mile into this belt. Then there are the larger ahupuaas, which are wider in the open country than the others, and on entering the woods expand laterally, so as to cut off all the smaller ones, and extend toward the mountain till they emerge into the open interior country; not, however, to converge to the point at the tops of the respective mountains. Only a few reach these elevations, sweeping past the upper ends of all the others, and, by virtue of some privilege in bird-catching, or some analogous right, taking the whole mountain to themselves. Thus Mauna Loa is shared by three great lands, Kapapala and Kahuku from Kau, and Humuula from Hilo. Possibly Keauhou from Kona may yet be proved to have had a fourth share. The whole main body of Mauna Kea belongs to one land from Hamakua, viz.: Kaohe, to whose owners belonged the sole privilege of capturing the ua'u, a mountain-inhabiting but sea-fishing bird. High up on its eastern flank, however, stretched the already mentioned land of Humuula, whose upper limits coincide with those of the *mamane*, a valuable mountain acacia, and which, starting from the shore near Laupahoehoe, extended across the upper ends of all other Hilo lands to the crater of Mokuaweoweo.

These same lands generally had the more extended sea privileges. While the smaller ahupuaas had to content themselves with the immediate shore fishery extending out not further than a man could touch bottom with his toes, the larger ones swept around outside of these, taking to themselves the main fisheries much in the same way as that in which the forests were appropriated. Concerning the latter, it should here be remarked that it was by virtue of some valuable product of said forests that the extension of terri-

tory took place. For instance, out of a dozen lands, only one possessed the right to *kalai waa,* hew out canoes from the koa forest. Another land embraced the *wauke* and *olona* grounds, the former for *kapa* and the latter for fish-line.

On east Maui, the division in its general principles was much the same as on Hawaii, save that the radial system was better adhered to.

In fact there is pointed out, to this day, on the sharp spur projecting into the East side of Halealaka crater, a rock called the "Pohaku oki aina," land-dividing rock, to which the larger lands came as a center. How many lands actually came up to this is not yet known.

On West Maui the valleys were a very marked and natural mode of division. The question suggests itself as to how the isthmus would be appropriated. Some powerful chiefs of Wailuku and Waikapu seem not only to have taken the isthmus, but to have extended their domain well up the slope at the foot of Haleakala. So that there is the rare case of a long range of lands in Kula, East Maui, without any sea-coast.

On Molokai and Lanai, there are exceptional cases of lands extending directly across from sea to sea.

On Oahu the ahupuaa seems to have been oftentimes quite extended. Waikiki, for instance, stretches from the west side of Makiki valley away to the east side of Wailupe, or nearly to the east point of the island. Honouliuli covers some forty thousand acres on the east slope of the Waianae mountains. Generally speaking, however, the valley idea predominates. Thus Nuuanu (with its branch Pauoa), Kalihi, Moanalua, Halawa etc., are each the limits of single lands. So Waimanalo, Kailua, Kaneohe, Heeia etc., are ahupuaas. The long, narrow strip so common on Hawaii, is less frequent on this island, excepting in Ewa district. Singularly enough the ahupuaa of Waianae mounts the summit of the Kaala range and descends into the table land between Ewa and Waialua, and sweeps on up to the summit of the Koolau mountains. One would suppose that naturally that table land would be divided between Ewa and Waialua.

On Kauai, the writer is not familiar with the general divisions.* Probably the interior of the island belongs to a few large lands, while narrow and rather short strips are quite common along the shore, interspersed with large or first-class ahupuaas.

NO. 3.

The next subject that claims attention is that of the subdivision of the Ahupuaa.

The subdivisions of the Ahupuaa were called *Ili*. Some of the smallest ahupuaas were not subdivided at all, or at least seem not to have been; while the larger ones sometimes contained as many as thirty or forty ilis, each of course named with its own individual title, and carefully marked out as to boundary. The word is the same as that used to designate surface, and, in latter times, area.

There were two features of the ili, referred to by the terms *lele* and *ku* which are worthy of notice. The former is its desultory character, like unto that of the States of Germany. That is to say, the ili often consisted of several distinct sections of land, one, for instance, on the seashore, another on dry, open land or *kula*, another in the regularly terraced and water kalo patch or *aina loi* district, and another still in the forest, thus again carrying out the equitable division system which we have seen in the ahupuaas. These separate pieces were called *lele*, i. e., "jumps," and were most common on Oahu. Indeed I know of none on the Island of Hawaii. Some remarkable examples occur near this town. Punahou had anciently a lot on the beach near the Kakaako Salt Works; then the large lot with the spring and kalo patches where the school now is, and again a forest patch on the steep sides of Manoa Valley. Kewalo meanwhile had its sea-coast adjoining Waikiki, its continuous kula on the plain and one half of Punchbowl hill, and its kalo land in Pauoa Valley. Kaakaukukui held Fisherman's Point, and the present harbor of Honolulu, then kalo land near the present Kukui Street, and also a large tract of forest at the head of Pauoa Valley. The kalo lands of Wailupe are in Palolo Valley. In Kalihi and

* Maps have since been made which show the conditions.

also in Ewa are ilis with from eight to ten different *leles*, a most prolific kind of lands, and now furnishing a truly desultory job for a surveyor to map out.

These different pieces are called variously, either by their own individual name, or by that of the whole ili, thus puzzling one sadly when attempting to obtain information with respect to them.

The Second feature is referred to in the word *ku*,—short for *ili kupono*. There were two kinds of ili; the ili of the ahupuaa and the ili kupono. The ili of the ahupuaa was a subdivision for the convenience of the chief holding the ahupuaa; *alii ai ahupuaa*.

The *konohikis* of these divisions were only the agents of the said chief, all the revenues of the land included, going to him, and the said land, in Hawaiian parlance, "belonging to the ahupuaa."

The *ili kupono*, on the contrary, was nearly independent. The transfer of the ahupuaa to a new chief did not carry with it the transfer of the *ili kupono* contained within its limits. The chiefs previously holding the ili kupono continued to hold them, whatever the change in the ahupuaa chief, having their own *koeles* (chief's patches) worked by their retainers. There was, however, a slight tribute of work due to the ahupuaa chief; sometimes one or two days in the month; sometimes even less, or only certain days in the year. The ilis which were used as places of refuge and those of the god Kaili, did not render even this tribute. Such were Kaahumanu's ilis in Waikiki.

Of the ili kupono, Waimea, on Hawaii, furnishes an eminent example. Nine-tenths of this ahupuaa are taken up with the independent ilis of Puukapu and Waikoloa, to say nothing of half a dozen small ones of the same kind. Accordingly when Waimea Ahupuaa was declared in late years a Crown Land, it was necessary to declare Puukapu also a Crown Land, as though not included in Waimea. Waikoloa was given by Kamehameha I. to Isaac Davis, and it has remained in the Davis family ever since.

When, therefore, the limits of Waimea were settled by the Boundary Commissioner, the Crown Commissioners knew hardly more than they had previously, of where the Crown Land was situated. How much labor and confusion this principle has brought about remains to be seen.

Within the ilis all large kalo patches seem to have specific names, especially on Oahu, which was the most microcosmic of the islands. The *koeles*, or chief's patches, more particularly. *Kihapai's*, i. e., dry land patches, with their intervening ridges of small stones, or earth or weeds, had also their appellation. These ridges of cultivation, often rows of sugar cane, too, were in cultivated sections very frequently the boundaries of the ahupuaa, called *iwi*, (bone,—short for *iwi kuamoo*, backbone), and curving enough they are. Sometimes changed in ancient times, amidst fierce battling between the clans each chief could summon from his land.

The date of this division is fixed about twenty generations back in Hawaiian tradition, the names of the chiefs establishing it being given. The Moku or District was fixed at the same time, such as Kona, Kau, Puna, Hilo, Hamakua and Kohala on Hawaii. On Maui are some smaller divisions than the Moku, called *kalana*, Lahaina being one of these. Wailuku, Waikapu, Waiehu, and Waihee were independent, belonging to no Moku. On the map it was necessary to form a new district and call it Wailuku, Nawaieha, the four waters, being too cumbersome and ill understood. Olaa, on Hawaii, is said to have been independent of Puna, and Waimea of Kohala. Otherwise the district division was very exact and comprehensive.

One other anomaly remains to be noted here. A large tract of forest land in Hamakua, Hawaii, was once cut off from a number of ahupuaas for the use of the whole district, and is called Kamoku to this day, becoming at the time of the "mahele" which must come next in our way,—Government Land.

NO. 4.

We now come in regular course to a brief notice of the Mahele.

The Mahele was a phenomenon in natural history not often repeated. The Mahele was, in one sense, a revolution. In another sense it was eminently a conservative movement.

To write a full history of this change would require more leisure, or more correctly speaking, more time and strength than most persons in our community and in active life have at their own command. It will only be in place here to indicate its main features. I am very well aware that there will be widely different views on this subject among those of the legal profession, and those put forth here may be called decidedly unprofessional. It may be suggested, however, that occasionally the unprofessional opinion has the advantage. This is often the case with respect to theological matters, sometimes decidedly so in medical matters, and the common sense of honest jurymen frequently cuts at once through the entanglements of legal questions on both sides to the desired point of equity and justice to both sides.

The *Mahele* was simply an endeavor on the part of the majority of the Hawaiian chiefs, and especially on the part of Kamehameha III. to secure to all parties what, on the ordinary principles of acquiring property, seemed to belong to them. It was contemporary with the organization of the departments of the Hawaiian Government in 1845-6.

The theory which was adopted, in effect, was this: That the King, the chiefs and the common people held each undivided shares, so to say, in the whole landed estate. Whatever the legal deduction from the status under the former feudal system might be, the fact in equity was acknowledged, that whoever had a share in making the land valuable, held an interest in that land.

Legally speaking, the title of the whole was in the King. The King, who conquered the whole, viz.: Kamehameha I., had partitioned the lands among his warrior chiefs, retaining a certain revenue from them, in default of payment of which, the land was forfeited. These chiefs did the same to those below them.

Kamehameha III. for the common good waived his title to the whole, under conditions. Conditions, that those under

the chiefs should be treated in like manner, and moreover, that a certain portion, one-third, should be given to a common landed estate called Government Lands, the proceeds of which were to go to the public treasury, and which should furnish that facility for the acquirement of real estate in fee simple, which is so necessary for the growth of a community.

In other words, the Hawaiian nation agreed to divide as individuals their as yet undivided inheritance, the King taking a share proportioned to the general idea of the dignity of his position. (It should be stated that the word *Mahele* signifies division.) It was moreover agreed that there was to be a portion devoted to the general good in two ways, viz.: by rendering it obtainable to those who desired land, and by using the proceeds for the benefit of the public treasury. It will be seen that there was a double mahele,—first of all, among themselves, and second, of each with the general treasury. This last was the trying point with the chiefs; it required no little effort to bring about its accomplishment, and no little self-denial and resolution on the part of those who thus gave up what they regarded as their lands. The scenes in the meeting of the council for this purpose have been described by eyewitnesses as thrillingly interesting. Almost every one of those who took part in this peaceful, but patriotic revolution, has gone from the presence, we hope not from the remembrance of this community. Among the ranks of these noble dead, are Kamehameha III., and Kekuananoa, Paki, Kekauonohi, John Ii, who was most active in bringing about the change, and a host of lesser chiefs. Messrs. Richards, Judd, Ricord and afterwards Lee, were the leading spirits in inducing the chiefs to see the benefits of the new policy and system.

There were two great sacrifices made by the chiefs. The division with the Government we have noticed. Far be it from any one to misappropriate these Government lands, thus conscientiously given up by the old Hawaiian chiefs for the national good. The other sacrifice was that of the *Kuleana*, or land of the small tenant. These small tenants were permitted to acquire a full title to the lands which they had

been improving for their own use. In the true view of the case, this was perfectly a measure of justice, for it was the labor of these people and of their ancestors that had made the land what it was. This subject will lead us to consider the Land Commission.

NO. 5.

The lands having been divided as we have seen in the last article, it became necessary in order to establish the real estate business of the Kingdom on a practical basis, to give some formal evidence of title sanctioned by the Law of the land. The mahale was an anomaly. The Land Commission appointed to carry out the principles of the mahele, was another. Both were eminently practical and just in their idea.

Five gentlemen, John Ricord, William Richards, Z. Kaauwai, James Young Kanehoa and John Ii were appointed by the King in February, 1846, to hear testimony upon the claims of individuals, and to issue awards to the claimants for the land claimed, by metes and bounds. These Commissioners drew up a careful statement of principles to guide their conduct in making the awards.

This statement was approved by Act of Legislature and made law. It was further ordained that no claim should be valid unless approved by them, and unless presented before a certain time. The only appeal was to the Supreme Court. The Commissioners took the oath of office, and held their first meeting for regular business in March, 1846. The first claim and award signed was to James Voss, on the lot at the South corner of Hotel and Alakea Streets. The taking of testimony was a hereculean task when we consider that the number of claimants were over ten thousand. It was found that the taking of testimony, the surveying of boundaries, and the making final award, would each have to be separate stages of work. Accordingly, while the first volume of Land Commission Records contain lengthy masses of testimony attached to each award, in the second volume awards only are given; the testimony being thereafter by itself in another series of separate vol-

umes. The Commissioners worked with most commendable energy, going to every part of the islands to meet the people, and prepare for awarding the kuleanas.

Kuleana means originally a property or business interest in anything. The common people were in former times assigned certain portions of the chief's lands, to occupy at the will of the chief. Generally speaking there was a good degree of permanence in this occupancy, provided that service was duly paid to the superior. In 1839 a law was promulgated that no one should be deprived of this land without due cause, which law was a preliminary step to the subsequent one of giving to all these common people who would come forward, present their claim, their testimony, and pay the expenses of settling the whole matter, a fee simple title in their improved lands. In the town of Honolulu all lots were to be subject to a commutation fee of one-fourth of their unimproved value to the Government. Elsewhere the award was in fee simple without commutation. These awarded claims came to be known by the term "kuleana."

After the testimony in regard to their existence was taken, the next step was to scatter a horde of surveyors all over the Kingdom, with memoranda of claims, to survey each separate one by itself, and send in the survey to the office, generally on a sheet of foolscap paper. At the office they were copied in huge unwieldy volumes. Volumes, however, ten in number, of infinite value to the real estate interests of this little Kingdom. Of the surveys more hereafter. They were generally paid for by the piece, at the cheap rate of two to three dollars per kuleana. The total expenses, for the Land Commission expenses were all borne by the claimants, and amounted to from $6.00 to $12.00 to each kuleana. Cheap enough; yet the poor natives were often a long time in collecting the amount to pay over to the agent who distributed the papers containing the awards.

In fact it seemed all like a dream to the common people, so long serfs under masters. All sorts of reports would spread through the country, to the effect that the whole thing

would be knocked in the head; that such and such lands were to have no kuleanas taken out of them, &c., &c.

Then there was a vast deal of haphazard about the matter. In kalo patch land it was comparatively easy to determine where and where not the kuleana should extend, though many a contest between the claimant and konohiki chief's man took place even there. It was impossible for the Commissioners to go upon the ground, so that responsibility in a large measure depended on the surveyor. In dry or kula land, where the soil has to remain fallow for years between crops, it was difficult to decide what a kuleana should contain, and as we shall see there was much variety of practice.

NO. 6.

Mention was made in the last number of the haphazard or lack of uniform rule in establishing the boundaries and extent of kuleanas. The best illustration of this may be derived from an example. Three surveyors were sent to Hawaii to as many different districts to measure and report kuleanas. Directions, "to include what the claimant has cultivated and improved." Surveyor No. 1, a stranger to the country, found the people cultivating on the kula land say two or three acres of upland kalo. Not taking into account the fact, alluded to in our last number, that it was necessary for the land to lie fallow for two or three years before another crop of kalo could be produced from it, he surveyed merely the amount under actual cultivation. The kuleanas were awarded accordingly, the poor people having no one to take their part, and, as a consequence, in many cases abandoning their newly acquired property as utterly insufficient for their needs.

No. 2, a native Hawaiian, was assigned to a district where the resident American missionary was one who took an active interest in the new order of things, and who believed, and not without some reason, that the people had the main right to the land any way, on general principles. The consequences of this was that the surveys were sent in from fifteen to thirty and even forty acres in extent and were awarded.

Surveyor No. 3*, meanwhile, after an ardous campaign, among the kalo patches, with an ever watchful konohiki to contest his progress, and to whom the reply to appeals for advice to the Land Commissioners was sent, "Do the best you can," came out into the kula lands of his district. Multiplying the amount under actual cultivation by the number of seasons in which it would have to lie fallow, the estimate was made of from six to twelve acres as the ordinary run of upland kuleanas, and surveys were sent in accordingly. Reports of what was going on in the neighboring districts soon came in, and, rather puzzled thereby, our man lay on his oars a few weeks to see what would turn up. Finding that his surveys, too, were approved of, he went on through the district on his own principles.

In the defense of the above inconsistency, the plea may be urged, that the Commissioners had such a mountain of business to dispose of that "Any way to get through" might well be their motto. To re-survey in all these cases was next to impossible, also to obtain full information. Then, while there lived a king who thus favored his subjects it was expedient to make all speed possible, lest a change might introduce worse confusion.

Another inconsistency was in the awarding of titles below high-water mark, and on reefs in some instances and not in others. The immediate vicinity of Honolulu harbor as compared with Pearl River and Kaneohe Bay furnishes a notable instance of this.

After the awards of the kuleanas came the awards to the lesser chiefs and to foreigners to whom lands had been given of the ilis we have described above. They were generally though not uniformly awarded by their external boundaries, expressly stating in the award, and in the patent based thereupon the *excepting of all kuleanas contained* therein.

The ahupuaas were awarded to the chiefs to whom they belonged in a similar manner, the exception including the ilis

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* The writer.

awarded as above, and also such ilis as by the Statute law were declared on the basis of the Mahele, as we have previously seen, to be either Crown or Government Lands. Of course when the Mahele was made the division took place; the ahupuaa to one chief or to the Crown or Government as the case might be, and the ili kupono, described in a previous number to other chiefs or the Crown or Government as the case might be. The Crown and Government lands were expressly set forth by name in the Statute, at the same time that the Land Commission was created.

It is this *existence of titles within titles unseparated one from another by especial survey* that creates the unmitigated state of confusion that now exists on these islands. It might as well be confessed and made public, that adequate steps may be taken if possible to clear up the confusion, heightened as it is ten-fold by the fact that all the kuleanas are recorded each by its own individual configuration and extent with no general map of the district. In the prospectus, so to call it, of the Land Commission, it was declared necessary to know the "configuration and extent of the several claims." The very important item of *location* was omitted. It was probably impossible to have carried out any general system of measurement which would have secured this, when we take into account the imperfect instruments employed by most of the men who were employed in this really national work.

Another example from actual experience may come in here, perhaps to advantage. In Kalihi, Oahu, is an ili of Government land. A large part of it was taken up, as usual, with kuleanas of the people resident thereon. The remainder was in all conceivable shapes, mixed in the interstices of the kuleanas, including, however, some very valuable land. For some years the sovereigns of the country diverted this land to their own use. When afterwards it was deemed advisable to use or dispose of the land for the benefit of the Government, a survey was necessary to find where the Government land was situated. To this end, every single kuleana lot to the number of fifty or thereabouts had to be re-surveyed and located, errors, inaccuracies and magnetic variation all to be taken into

account and their descriptions made out of what remained, to agree with the adjoining kuleanas, the whole involving about two months of labor. The resultant remainder of Government lots of land were worth somewhere near $1,500. More of this hereafter.

NO. 7.

To sit in judgment on the past is not always advisable. It is easy, in the light of subsequent events to perceive what would have been the wiser course. But it is not always easy to put ourselves in the places of our predecessors; to realize what difficulties may have beset them, and what obstacles may have prevented the carrying out of their own conceptions of what should have been done.

This remark applies to the work of the Land Commission. The following imperfections in their work are very noticeable:

First—That already noticed, including titles within titles; kuleanas within ilis; ilis within ahupuaas and so on; without distinct specification of what was excepted within. It has frequently occurred that persons have purchased estate on the basis of the acreage of the whole, and then found, to their dismay, that one-fourth, or even one-half of the area specified was taken up in kuleanas; titles in fact just as good as that of the larger estate around them. This has been a standing grievance with purchasers in this Kingdom, and has tended to bring the kuleana system into disfavor.

Second—The Land Commission ought to have continued till all the land had been properly apportioned and award passed thereupon by the Commissioners, including in these awards also the Government and Crown lands. The object aimed at, viz., the settling, for once at least of titles, would then have been gained. The omission of the Government and Crown Lands has created uncertainty all over the group as to boundaries even to this day. The almost unlimited powers of the Commissioners should have been used to put matters in a practical and accessible shape.

Third—The number of steps requisite to procure a full title has been too great. First the mahele, then the award, then

the Royal Patent. Now in the town of Honolulu, we will say, A and B have adjacent lots.

A procures his award, and immediately goes on, pays the Government commutation, and receives a Royal Patent. B merely contents himself with the Land Commissioners award, leaving the future to look out for the payment of commutation. A and B both sell to C. C cuts up his property into small lots and sells. Now in some or other of these lots there will be at the same time land commuted for, and land as yet uncommuted for. D, who has purchased one of these heterogeneous titles, wishes a full title, and is obliged to hire surveyors, lawyers and what not to find the imaginary line in his property, dividing the patented portion from the unpatented; describe the unpatented portion, and take out his "R. P." for the same in the name of the original awardee, dead, say twenty years ago. It would seem as if this threat of a Government one-fourth ought to have been disposed of at the start.

Fourth—While the surveys were carefully recorded and indexed, there was an unaccountable lack of uniformity in the methods followed in making them. It would seem as though a person having the practical knowledge possessed by the late Hon. W. L. Lee, for so many years President of the Commission, would have issued certain uniform rules to the persons employed. Instead thereof, we have every possible method of measurement adopted, every conceivable scale employed, meridians pointing everywhere, no marking of corners; in short, everything left to the sweet will of the man who was hired at from two to three dollars per kuleana to do the measurement. Nor was one district assigned to one man. No less than a dozen tried their hands at Waikiki, no one being required to guide himself by the notes of another. Of course overlaps and interlayers are the most common things imaginable. It has been the practice heretofore to regard the person holding the earlier award to take precedence in the case of an overlap, and the one holding possession in the case of an interlayer. Some doubts in high quarters have been expressed however on this matter.

As we have said above, the real reason for all this looseness lies in the fact that there was little money to pay out, and little time to wait, for the work. It may be added that there was not then a single thoroughly competent land surveyor on the ground. The grounds for this assertion may be stated hereafter. Civil engineers there were and amateur surveyors, but no thoroughly competent land surveyor.

To hasten the "quieting of titles" it was enacted by the Legislature that all claims not presented before a certain date should revert to the Government. This date was postponed several times. The Land Commission itself was driven to the policy of awarding titles by ancient boundaries without survey; that is to say, simply by the name of the ahupuaa or ili, leaving the owners to fix the boundaries as best they could. In that way it was enabled to close its labors at the time prescribed by the Statute, viz., on the 31st of March, 1855. The receiving of evidence was finally closed on the 30th of December previous.

Even then an act had to be passed in 1862, "for the relief of certain Konohiki's," enabling some such who had received land at the time of the mahele to receive an award from the Interior Department for the same, up to a certain date, beyond which, the land if unawarded was to revert to the Government.

The question now comes up: Will these lands thus unawarded now be claimed by the Government? and, moreover, will similar lots in town be thus claimed?* The view of the case taken at the time, was this: "For the good of the community, land owners must be compelled to go through certain forms of law, failing in which, the lands are forfeited. "Was or was not this in the circumstances a constitutional act?"

NO. 8.

The land in the Hawaiian Islands was considered at the time of the Mahele as belonging to the nation. It was divided

* The point has since been settled. *Ed.*

off according to principles deemed equitable, and titles were given emanating really from the Government representing the nation, by the King as the executive power. This I think is the true theory of the then new departure in land matters. The power to whom were given the Crown Lands was not the power that gave legality to the new titles. The Crown Lands were set aside for the private emolument of the King. The Government Lands were for the benefit of the whole,—for the parties as a whole, that divided the land.

When, therefore, the rule was made, or law passed, that lands not awarded should vest in the Government, it would have seemed to be perfectly in the power of those making the law, so to enact. It hardly seems proper, therefore, at the present day, to assume that such lands should revert to the Crown as "Crown Lands." They should revert to the Crown as the representative of the Government, not for the private use of the King, but for that which the King represents in his official capacity.

Where parties have been for a long time in actual occupation of such lands, it would seem as if some liberal terms might be adopted which would facilitate the obtaining of a title without waiving the right of the Government, against which the statute of limitations, i. e., of twenty years occupation, does not hold.

LAND SALES.

The Government Lands about the year 1850, were put into the market throughout the islands. Previous sales had been made in a few localities, especially in Makawao and Manoa Valley. Agents were appointed in the different districts to receive applications, to attend to the surveys and to report, also to collect the money for the land and forward to the Interior Office. The same desultory system of surveying was followed as in the case of kuleanas. Probably between the year 1850 and 1860, nine-tenths of the available Government Land was taken up.* The agents were some of them the Am-

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i. e. what was then regarded as available.

erican missionaries, who considered it not inconsistent with their position to assist the people in obtaining lands, in advance of mere speculators. A commission was allowed; in at least one case it was declined, all service being rendered gratis.

After all this selling of land, the Government was perfectly in the dark as to what remained. A lull in the business took place, and when in after years some of the remnants were applied for, it was impossible to proceed with any confidence in disposing of them. In addition to this, a new policy came in with another administration, of refusing to sell land. Partly, from the revival of the ancient theory that the King was the Government; partly from a feeling that a fixed revenue might be derived from the remainder; partly from the cropping out of the over-prevalent dislike of seeing lands go into the hands of foreigners; and partly from the difficulty of proceeding intelligently to work.

For instance; and this is from actual experience; a tract of, say ten acres, in Palolo Valley remained to the Government. It lies at the foot of the steep valley side, and may or may not extend up that side or pali to its summit. The land above was awarded by survey, and to find how far down the face of the mountain it may extend, it is necessary to run all the old lines of that upper land—probably two or three days of hard work would be none too much to do this in a reliable manner. In fact, one can be sure of nothing in such cases without surveying all the adjoining lands. A perfect incubus this has been on the disposal of the remaining Government Lands.

It was this state of things, as much as anything else that led the late Minister of the Interior, Dr. F. W. Hutchinson, to institute the Government Survey. A general survey seemed the only possible way to get at the facts of the case. It would be perfectly impossible for the Government to-day to state definitely what land it possessed in any one district.

Add to this the need of general maps for business purposes, for assessment of taxes, for any discussion of schemes for the benefit of the country; for searching of records; for the information of courts of law; of strangers, especially of scientific

men; to say nothing of navigators; and one sees abundant reason why a general survey should be made.

Moreover, the Government failed in one important part of its duty; namely in locating its own grants and awards. It is but fair that it should undertake that work as far as it is practically useful and is possible without too great expense.

Another demand for general maps lies in the fact that while a person may in a few years become a walking encyclopedia of information respecting localities and titles, &c., in a district, he is liable to leave at any time, when all his stores of knowledge become annihilated in a moment, no record thereof being left for the benefit of his successor.

NO. 9.

There is now remaining to be noticed the "Boundary Commission" business. As was stated before, a large number of Ahupuaas and Ilis were awarded by name only. The Land Commission having ceased to exist, it became necessary to provide some means of legalizing the lines of boundary between awarded lands wherever they had not been awarded by survey. This and nothing else is the business of the Boundary Commission. It is not concerned with boundary disputes as such. It is only when the locality of an award, and in a very few cases of a Royal Patent, has nothing but the ancient traditions and testimony founded thereon to determine it, that the Commissioner is called upon by the owner to issue a "Certificate" defining it "either by survey, or by natural topographical features, or by permanent boundary marks." It will be seen that a description by means of ancient names of localities,—"*wahi pana*"—is not in the limits of the statute.

The act for the appointment of Boundary Commissioners was passed in 1862. At first there were two for each gubernational district, the Police or District Justice in each place acting as umpire in case they disagreed. This, as might be expected, was a failure, and subsequently the late G. M. Robertson of the Supreme Bench became sole Commissioner for the group. In 1868 the law was modified, since which time there have been four Commissioners, one in each main dis-

trict. Their work has progressed very slowly owing to various causes.

It is a matter of regret that there has been so little uniformity in their methods of procedure. Of a large number of lands thus defined, no maps whatever have been filed in the Interior Department. Complaints often arise that sufficient notice is not given to parties concerned, residing as they oftentimes do at a distance. The best way of procedure would seem to be this: Maps of the lands in question prepared from good surveys by persons approved at the Interior Office, and containing such full information as to be intelligible to all concerned, should be on file in some public office, say for ninety days previous to the decision, and due notice thereof should be given in order that all parties may consider the matter at their leisure.

A better organized Land Office is very much needed. The General Clerk of the Interior Office has too great a diversity of business to give due attention to it. The second clerk is occupied mainly in making out Royal Patents on awards and furnishing copies of documents. The Surveyor-General has the Topographical Survey on his hands, while his assistants are bandied about from one job to another, the whole groaning under the weight of the tanglement of old and new that has been previously pointed out in these papers.

The object aimed at should be that the Government should know the location of its own Patents for Land, and to be able to furnish information concerning the same. It should know too, what is left unpatented, and it was more for this object than any other that the then Minister of Interior, F. W. Hutchinson, instituted the Government Survey in 1870.

The remaining stage in the history of land matters in these Islands is the work of the Boundary Commissioners. Before noticing this subject, it may be well to introduce a few articles on practical work relating to boundaries. It results from the nature of the case, that a large part of the surveying of boundaries must be done by amateurs, especially of small lots in the country districts. That is to say, by persons who, having had a general education, take up the business for

true north pole, as follows, beginning at the south corner: 1 at side, N. 70° E.; 2nd N. 20° W.; 3rd, S. 70° W.; 4th, S. 20° E.

Now take a very common case with reference to this lot; suppose at the initial or South corner of the declination of the needle, i. e., its deviation from true north is 10°E; at the next or East corner it is 9°; at the North corner it is 8°; at the West corner it is again 9°; this last being the normal declination for the district where the lot is situated. A mass of rock or of black sand under the surface would easily produce this irregularity.

What in such a case will be the standard of direction? There have been three different methods followed by the persons employed at these Islands. The first class may be called the local needle surveyors. They use the needle for a meridian just as it stands at each station. In this case there would be three different standards of direction employed. Of this more hereafter. The second class are the initial needle surveyors, who use the meridian as indicated by the needle at the initial point of the lot as the standard for the whole. The third class may be said to use the average needle method. The magnetic meridian as indicated at the 9° stations would be the standard in this method. I will now give the notes of surveyors of this lot by the three different methods, as well as the true notes:

No.	True mer.	Local needle.	Initial needle.	Avg. needle.	Distance.
1—	N 70° E	N 60° E	N 60° E	N 61° E	344 feet
2—	N 20° W	N 29° W	N 30° W	N 29° W	344 feet
3—	S 70° W	S 62° W	S 60° W	S 61° W	344 feet
4—	S 20° E	S 29° E	S 30° E	S 29° E	344 feet.

The middle three columns give a bona fide specimen of what is really the fact with respect to magnetic surveys. The reader may study out the matter and meditate on the probable confusion likely to arise until the appearance of the next article, if the latter is not too long delayed.

NO. 10.

The magnetic needle having been used as the basis for the describing of boundaries in this country, it becomes thereby an object of study, in order that persons locating those boundaries may proceed with any degree of certainty. As the writer has been requested to make especial investigations in this matter, in connection with the work of the Government Survey, and as the collection of information on this subject is strictly within the scope of that work, this occasion is taken of presenting some of the results of such investigation.

Three different elements of uncertainty must be taken into consideration in following the magnetic bearings given in old records, that is to say there are three different questions to be considered. First: has the direction of the needle changed, say in the last twenty-five years; if it has, how much and which way?

Second: What local causes affect the needle, and in what manner and degree do they affect it?

Third: What method was followed in the original survey, the "local needle" method, "initial needle," or "average needle'" method ? And did the instruments really indicate the magnetic bearing, or was there in many cases an index error?

It will now be seen that the old proverb, "Lazy folks take the most pains," is not without its application here; that it involves as much work to depend on the needle as to ascertain and use a true meridian, and infinitely more vexation. Our paper, too, threatens to become scientific, concerning which fact it may be said, that a little study will hurt no one, and benefit many.

As to whether the needle has changed its direction, there are different opinions.* One, that there has been no change in the period above mentioned; seeing that so many known

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* This question has been settled since this was written.

lines appear to have the same bearings as when recorded about 1850. Moreover, there are records of old observations of magnetic declination, differing but little, if any, from the present.

The British Admiralty Chart, while expressing uncertainty on the matter, says that there appears to have been a slight motion of the needle to the Westward. The opinion of others is that the needle has moved to the Eastward, at the rate of about 1½ minutes of arc per year. That is to say, the Easterly Declination forty years ago was 8° 15′, and at present is 9° 15′ for the Island of Oahu. This is my own opinion, and the reasons for it will be given.

Records of magnetic declination, as observed by old navigators, are sufficiently correct for sea-going purposes, but not for the present purpose. If made at sea the observations are not over accurate; if on shore, a great number of stations must be taken to be sure no local influences are at work. On Quarantine Island, west of Honolulu Harbor, the declination in 1871 was 9° 35′, while on Fisherman's Point (Kaakaako), east of the same harbor, it was 9° 18′, and this uniformly over a large area of either locality. At Kealakekua Bay and Kawaihae, the needle would doubtless be drawn toward the mass of land to the eastward.

Then as to the bearing of old lines. In the first place one can never be sure from which end of the line the bearing was taken. The writer has often been nonplussed in this respect. In the second place the old compasses did not agree among themselves, varying nearly a whole degree. And it is very hard to find old lines of perfectly undoubted authority. The only really reliable evidence is from observations, taken from the same point, with the same compass, of a large number of prominent points, with an intervening period of quite a number of years. If the result of this is corroborated by other evidence, it may be relied upon.

In 1853 I took, with great care, the bearings of a number of well defined mountain summits from a known locality on Hawaii, where no change in the needle would be caused by moving from 40 to 50 feet in any direction. In 1872 the

same bearings were observed with the same instrument, which at both times was in good order. The difference was about 40′, as specified above, plus on Northwesterly bearings, and minus on Northeasterly. A good many other observations corroborate this definite result, and the testimony of the late S. C. Wiltse, who had an opportunity of running a large number of long lines on North Hawaii, where good boundary marks existed, was decidedly to the same effect, viz: that the needle pointed 40′ to the eastward of what it did thirty years since.

Wilkes' Exploring expedition visited these Islands in 1841. The "variation" marked on their charts is 8° 15′. Now this expedition was not always correct in its reports, but it would hardly seem probable, that with all the facilities at their command, that they should be far out in this point. Their observatory I believe, was in the Palace grounds, the present declination being 9° 15′ in that neighborhood. This would corroborate the above result.

It is desirable that those who have the facts bearing on this subject, should communicate them.

"Well, what of it?" some one says. Simply this, that it makes a difference of direction of one foot for a hundred feet distance, or twenty-five feet in half a mile. Now supposing a lot, one-half mile square, bordering on the sea shore say a sand beach, with no permanent marks thereupon, the inland corners are fixed and known. For the location of the points on the beach, there is no guide excepting the magnetic bearings from the known points. A difference of twenty-five feet, produced by ignoring the change in the needle (called the secular change), would give room enough one side or the other for a small cottage. If such a building happened to be, as it well might be, on the disputed ground, a good line of litigation would probably ensue. That is where the practical side of the question would appear. Cases just like the above do occur. It does not follow, however, that the allowance for variation should always be made, as there are other things to be considered.

NO. 11.

Local magnetic declination is the term that should be applied to the angle which the needle makes with the true meridian at any particular station or corner. *Local deviation* may be used to express the amount of *difference* between this and the *normal* declination, or that which would exist if no strictly local causes affected the direction of the needle, and which as we have seen, is about 9° 15′ at present on Oahu.* Having disposed of the "secular change" we now come to this subject of local deviation, as manifest in the varying amounts of the declination at different localities.

The directions for work, in the books on compass surveying, proceed on the theory that the needle, in any section of country, has a uniform declination, especial stations alone excepted, and that only these special stations need attention. But on these islands the especial cases are the majority. That is to say, on average ground, not more than one-half of the stations will be found to agree among themselves, the others indicating a local deviation of from 15 minutes to two degrees in either direction from the normal declination.

At present, on work connected with the Government Survey, the declination is noted at nearly every station. On average rough country, the figures stand at every possible value between 8° and 10° 30′, this being a range of one degree and a quarter to each side of the normal amount. The only section of the country I have ever found where the needle seemed to be absolutely uniform was on the long stretch of coral plain between Pearl River and Barber's Point. In other sections the range is small, say only half a degree each way.

Then there are localities where the needle runs perfectly wild, the lowest declination yet observed by myself, being 0°, and the highest 25°, the latter being in the immediate vicinity of magnetic iron ore, which was found by digging below the surface.

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* *i. e.* in 1874.

In looking for any general laws to govern this matter, it appears that masses of earth in most cases attract the north end of the needle. Supposing a deep gulch running nearly north and south, with table land on either side. The north end of the needle on the west bank of this gulch will be drawn to the eastward, causing a greater declination. On points on the Piiholo Gulch, Makawao, the needle read, according to the records 3° on one bank, against 12° on the other. On the ridge back of Puu Ohia, or Tantalus, Oahu, is the most marked instance on record of this fact, the needle on the edge of the pali overlooking Manoa Valley corresponding exactly with the true meridian, while about 500 feet distant, overlooking Pauoa Valley it points 16° to the eastward. Down in Pauoa Valley again, at the foot of the northwest *pali*, (which means, we would here remark, any steep mountain side or precipice), the declination runs down to 2°, or 7° less than the average. These are very rare cases however. On the northwest foot of Punchbowl Hill (Puu Owaina) the needle stands at 10°; on the southeast foot at 8° 30′ in both cases evidently attracted toward the hill. I am satisfied that this is the case with respect to most of the lesser masses of ground.

Some singular exceptions to this rule occur in cases where large mountains are near by. At Lahaina, Maui, one would suppose that the mountain would draw the needle to the eastward. Instead of this the declination is less than usual, being 8°, and at Wailuku, on the other (east) side of the same mountain it is 9° 30′ as if repelled to the eastward; while on the low flat isthmus, away from the mountain, it will average about 8° 30′. The same repulsion from the mountain is noticeable at Oloalu, south of Lahaina. The Waianae mountains on this island, seem to have a similar effect, the declination along the coast of the Waianae District running down to 8° , 7°, and even 6°, on Professor Alexander's recent survey.

The Koolau range, as you approach it from either side seems to draw the needle into parallelism with itself. The great mountains of Hawaii have not yet been sufficiently studied to report upon. The Kohala mountain, Hawaii, attracts the north end of the needle.

This feature, of districts of varying declination, is probably the most difficult matter to deal with in compass surveying. Some of the districts have apparently no reason for their existence. For instance the portion of Honolulu from the Post Office to the river is a 10° district; the east portion of town is a 9° district; near Capt. Luce's again the declination rises to near 10°; and at Waikiki beach goes down to 9°, rising again as you approach Diamond Head. Now in all this area, the needle appears to behave remarkably well. Probably the difference between foresights and backsights would not be noticed in ordinary work. It is only as one carries a true meridian series of sights over a long distance that the change becomes apparent. The cause must be either beds of volcanic matter under the sandy surface, or else the distant spurs of the mountain producing this effect. As to the theory of underground streams of water I have somehow little faith in it. They may possibly have an electric effect.

It will be seen from above, that for accurate work, the needle compass, set up at an independent station, i. e., unconnected with known lines, is absolutely *never* to be trusted. Moreover, how necessary it is to state what one means, when he states that a line bears N 40° E., or when he gives any other bearing. By what standard is it 40°?

As to the *diurnal movement* of the needle, namely, its following the sun to the ewstward from sunrise to 2 P. M., and then returning to the eastward every day, it amounts here to 8 minutes, and has little practical bearing on matters here treated of. It is well, however, to know that it exists. There are other vagaries of the needle, such as the lunar diurnal variation, and etc., known only in the sphere of magnetic observatory work, and entirely out of our present range.

NO. 12.

The third element to be attended to in respect to the magnetic compass surveying of the past years is the practice of the surveyors themselves, and the condition of their instruments at the time when used.

dicated, characterized as the *local* needle, *initial* needle and *average* needle surveying. Now, if each employee of the Land Commission had been required to follow one particular method or, better, to *state what his practice was*, we should be far better off than at present. As it is, it is only by long trial and experience that we can find out the particular methods of each surveyor. One gleam of common sense appears on the record of survey of Webster's, viz., an appended note to this effect: "The bearings given agree with the needle only on the first and second stations of the survey, the others being laid off by their proper angles from these, the needle differing in some cases

In a previous number the different methods have been intwo or three degrees from the bearing given." (Vol. 10, page 53, L. C. A. Records.) This signifies of course that Webster was an initial needle surveyor, in fact the only one. There is evidence that Turner followed that method sometimes, and sometimes did not. Even Webster sometimes seemed to change his meridian. I have endeavored in vain to gather from Messrs. Makalena and S. P. Kalama, who have done an immense amount of boundary measurement, what their own way of disposing of local deviation has been. The Hawaiian language in fact seems incompetent to grapple with the subject.

On the Island of Hawaii, S. C. Wiltse, H. M. Lyman and the present writer, were "average needle" surveyors. Probably the other Lyman brothers also, who, however, can report for themselves. We are forced to the conclusion that most of the others, simply followed the local needle, trusting to luck to get their plots together. Metcalf was a very shrewd and practical man; his surveys have the merit of always exhibiting and referring to natural features for fixing the lines run. He made frequent marks too; most of the surveyors being very lax in this matter. In fact, when I am shown a buried bottle as marking a corner, I am always suspicious of it, as a late innovation.

It would be of great value to have a number of field books of each surveyor, stored away among the Government Survey archives. Any person who would furnish any such, of the old

surveyors, would be at least gratefully remembered. In all scientific work original records have a value much above what is generally supposed. One of these field books would generally show in some way the practice of the owner thereof.

With respect to the instruments used, the two Richardson brothers, who surveyed a large number of the earlier awards in the town of Honolulu, seem to have had very poor compasses, as the bearings seldom close. Their measured distances, however, were quite accurate, and generally furnish the means of locating their surveys, especially as they never indulged in that most execrable and lazy habit adopted by some, of not giving the last side and simply saying "thence to point of beginning." More of this hereafter.

With all Metcalf's care in other espects, he seems to have had a compass, that in sea phrase was "swung wrong," i. e., the zero of the plate was not parallel with the sights. So that its bearings were always about 50′, or nearly a degree too much for northwest, and too little for northeast courses. Accordingly his surveys must be run with no allowances for secular change, and in fact with a little allowance the other way.* Most of the Land Commission surveyors were furnished with Gurley compasses which were new and quite correct.

No rule can be given for running out old surveys. It is delicate and responsible work, of which much must be done on the islands. Keen powers of observation, patience in comparing different surveys, and conscientious faithfulness, in addition to a knowledge of the facts indicated above, are the principal requisites. One rule should be to record all sights and measurements just as faithfully and fully as though it were new work. Never go into the field with a Royal Patent in the hand but have everything in the field book beforehand. Another rule, never express an opinion until satisfied in your own mind, as to the final decision.

With respect to new work, the faults of all the old methods should now be pointed out, and avoided. The "local needle"

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* *i. e.* in 1874

method has only this to commend it, viz., the ease of setting up on the beginning of the line and running it provided you know it. Of course no correct plan can be made by it. And how about sides to whose corners the instrument cannot go? And no lines can be run backwards—a necessary expedient in many cases.

The "initial needle" method has this great drawback, that it necessitates going to the initial point. Now other points may be as perfectly known as that one, and in the case of large lands vary very much nearer. Another difficulty, two adjoining lands have, we suppose, different initial points, at which the local declination is different. Sides common to both must then, be consistent with their respective surveys have diverse bearings. Another difficulty is when the "march of civilization" brings a lamp post or water pipe or corrugated iron roof near the said initial point.

The "average needle" method is the best of the three, but is difficult of use because of the difficulty of determining said average. If the variation is given, one might as well use the true meridian, as it amounts to the same thing. Our next subject will therefore be some practical method of providing a uniform meridian for new work to be done hereafter.

NO. 13.

We now come to the question as to what standard of direction shall be employed in making new surveys in any part of the islands. The answer most certainly is, the *true meridian*. A timid policy would cling to the established methods, would suggest the difficulty and liability to error of establishing true meridian bearings; would fear, moreover, the confusion apt to arise from having two different systems on record. The confusion, however, cannot be greater than at present; and when one has once experienced the accuracy and confidence of procedure connected with true meridian work, he will be slow to return to the unsteady methods of the needle, of which its dancing on the pivot is a fit emblem.

There is only one other method worthy of notice. This is to take the bearing of a distant fixed point from the initial point,

and assuming said bearing to be correct, record it in the notes, and proceed to lay off all the other lines in the survey from this. The formula, then, for the description, would read like this: "Beginning at .....,whence by the meridian of direction adopted for this survey the highest point of Diamond Head bears .....and etc." This is often times a good way when there is not time to do better. It is liable to two objections: One is, that trees are apt to grow up and houses to be built, cutting off the view; another, that more uniformity between different surveys is desirable than can be secured by this method.

How then can a true meridian bearing be ascertained by the ordinary surveyor furnished with only a compass with sights. With a theodolite, it may here be premised, the most practical course is to take one or more solar azimuths at some point, either on the line of survey, or connected therewith. With a compass, both of the two following methods are practicable, and not difficult. Every surveyor is supposed to provide himself with means for knowing the declination of the sun at any given time, and also the time when the Polar Star passes the meridian. Gillespie's Surveying gives the latter. The Abridged American Almanac is the most conveniently obtained source of information.

The first method is by azimuth observation of the sun, taken when it is either rising or setting, called generally an "amplitude." (*Azimuth* means simply *direction, specified by measuring around the horizon from some adopted point in the horizon.* In all great surveys this point is the *South* point, and the azimuth angle is measured around by the West, entirely around the circle, or up to 360°.) There are comparatively few localities on the islands where either the eastern or western horizon cannot be seen, hence the advantage of this method.

We will suppose ourselves at work on a tract of three or four hundred acres. Our camp for the night, or else the house where we stop should be in sight of some elevated point in the said tract. Call that elevated point an "azimuth station" an leave a flag on it. Just before sunset "set up" at camp, and

take the bearing of this flag, and record it. Then without removing the instrument, watching the movement when the center of the sun is just one solar diameter above the horizon, i. e., when the lower limb is one-half the diameter of the sun from the horizon, take the bearing of the center of the sun and record that. Now you have the angle between the azimuth station, whose true bearing you do not know, and the sun, whose true bearing you will find by the following simple rule:

From the logarithmic sine of the sun's declination subtract the logarithmic cosine of the latitude of the place. The remainder is the logarithmic sine of the angle between sun's center and due East or West.

The latitude is known with sufficient accuracy for compass work for the present maps. We have now the true bearing of the sun, and, from that and the included angle, the true bearing of the azimuth station. Now leave a flag where the compass stood, and the next morning go first to the azimuth station, and sight back on the known bearing. Then sight on some marked and well-defined distant point, and deduce its true bearings from the already known line. Record it carefully, and you now have a standard for the whole survey.*

The second method depends on the Pole Star using the azimuth station the same way. The books have a great flourish of plumblines, long poles, etc., with a waiting until the star is either on the meridian or six hours from it. Now no workman intends to sit up until midnight to wait for the star to pass the meridian, so set your watch by the corrected sun the day previous. If you stop at a house, tack on the gable end thereof a small staff, as large and long as an umbrella handle. Have it perpendicular. If there is no house, tack it on a tree. Just as soon as you can see the Pole Star, take out the tripod (only) of the compass. Set it so that to your eye held carefully above the center of the spindle whereupon the compass usually sets, the star will be hid by the staff on the house. That is, the three are in exact range. Note the time, and leave the tripod standing until morning, only "plumb down" and drive a peg as a precaution. Your table

* With a surveyor's transit the azimuth is obtained directly by computation from the altitude of the sun, its declination and the latitude.

gives the time when the star passes the meridian, and the watch the interval between the observation and the meridian passage either before or after. The appended table will show the corresponding difference in azimuth (for the middle latitude of this group) between the star and the true pole. In the morning range out very carefully the line of the night before. Its true bearing will be known from the appended table, and the transfer of this to the work required will be done in the same way as in the solar method above, one method indeed being a good check on the other.

TABLE FOR POLE STAR.

FOR 1874.*

Time Before Or After Meridian Pas.		Angle.		Time.		Angle.		Time.		Angle.	
H	M	°	′	H	M	°	′	H	M	°	′
0	10	0	4	2	10	0	48	4	10	1	20
0	20	0	8	2	20	0	51	4	20	1	22
0	30	0	12	2	30	0	55	4	30	1	23
0	40	0	16	2	40	0	58	4	40	1	24
0	50	0	20	2	50	1	01	4	50	1	25
1	00	0	24	3	00	1	04	5	00	1	26
1	10	0	27	3	10	1	06	5	10	1	27
1	20	0	31	3	20	1	09	5	20	1	28
1	30	0	34	3	30	1	11	5	30	1	29
1	40	0	38	3	40	1	14	5	40	1	29
1	50	0	42	3	50	1	16	5	50	1	29
2	00	0	45	4	00	1	18	6	00	1	29

NO. 14.

There have been published lately Solar Azimuth Tables, adapted to tropical latitudes, giving azimuths of the sun for every four minutes of time through the day. Furnished with these, and with a good watch one would have no excuse for using anything but a true meridian. They are published by Potter of London.

It will be asked now, how the work is to be carried along from a line of known bearing, through a succession of courses

* Diminish these angles 3 per cent for every ten years later than 1874.

and distances. With the "vernier plate" compasses, this should be done by turning the plate until the needle points to the true bearing of the known line sighted upon. Then when the compass is pointed on other lines from the same station, the needle will indicate their true bearing. Now when the surveyor goes to the next station he should sight back, and if the needle shows local deviation, turn the plate again until the true bearing is indicated by the needle. The plate will then be set for that station, and all bearings should be read from in that position. So go on, always working from a known line.

If there is no vernier plate, then there must be addition or subtraction, as the case may require, of the difference between the known true bearing and the apparent magnetic reading. This appears rather appalling at first, but is not difficult when one becomes accustomed to it.

A few more suggestions may be in place here as assisting in reducing matters to a little more uniformity and order. The matter of a *standard* of direction has been treated of. The triangle sides of the Government Survey, it is almost needless to say, furnish, wherever established, reliable measures of direction, and work, where it is possible, should be run from them. For a standard of *length* nothing is better than the modern steel fifty-foot chain, with brazed links. There are many reasons for adhering to the *foot* as the unit of length; and in this matter the writer speaks with full experience. The four-pole chain is not as convenient in the field, and moreover introduces, unnecessarily, a new unit of length, viz., "Link." It makes confusion wherever town and country work meet.

With respect to the French system of measures, I would say: Go not astray after the false god of the *metre*. The Anglo-Saxon foot is just as decimally convenient a unit; is far better proportioned to the human figure, and consequently to the size of everything we use, articles of furniture, lumber, draught of ships, in fact to more of our daily life than any one would at first imagine. What, under the metric system, is to be the carpenter's rule? What the chain? For metres are long and decimetres too short for convenience. When we re-

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flect how extensive are the mechanical industries and architectural measurements of two such nations as the United States and Great Britain we shall see the folly of their endeavoring to change the foot for the metre. For the engineer the foot may be divided decimally and for the carpenter duodecimally. It would be an improvement to make the acre to consist of 50,000 square feet, and the statute mile, 5000 lineal feet. Then 500 acres would make a square mile, and a lot of 100 x 50 would be a tenth of an acre.

With respect to the matter of care in standards of length it may be remarked that a surveyor was once found by the writer using a four-pole chain *eleven inches* too long. This was not so strange either, as an opening of only one-thirtieth of an inch in each ring and link would produce this effect. It reminds me of a story of a Maui surveyor, who, when remonstrated with because his chain was a couple of inches too long, remarked: "That is queer; why I took out a link or two yesterday."

Perhaps nothing tests the business ability of a surveyor so much as the locating of the "initial point" so that it can be identified in future years with certainty. With the improved methods of measurement, it should be connected with some point not likely to be mistaken or to be moved, even if not less than half a mile distant. Illustrative of the fugacious character of points of supposed permanence—one of the estates adjoining this town started its lines from the middle of the end of a bridge. With rejoicing at the supposed certainty of "I. P." the boundaries were run out, and several apparently glaring errors detected in neighboring points. Eventually, however, it transpired that the old abutments of the bridge had been taken down, and in rebuilding, moved some sixteen feet, thus upsetting all theories of locality founded upon said abutments. Probable permanence, therefore, becomes a very important element in selecting points of reference. Distance and bearing from a near point, with bearing to some very distant sharp point is the best combination. Waterfalls are especially marked and permanent objects.

The most available material for marking corners—a most important duty—is a sunken stone, easily seen, with a buried one beneath it. On both should be clear cut characters, cut with a cold chisel, and with some uniform method of location and marking peculiar to the surveyor himself, to prevent counterfeiting. Where there are no stones, carry bricks on a pack animal and having marked the surface with a trench—a Maltese cross is the best shape, as giving a definite center—bury the well-marked brick in proper position below. Bottles are too common, and so are false marks.

The whole line should be described by bearings and distances, even when it is a gulch or line of coast, or a ridge. It is not sufficient to say, "Thence along the shore to point of beginning." For one reason, there should always be a check to the work which can only be furnished by a *complete chain of courses* around the whole piece. For another reason it is often desired to plot the land from the notes in connected district maps. It is not, however, proper to closely follow the crooks and turns, in said notes. The best way is to connect prominent points in ridges, coasts and gulches, and give the direct course and distance from one to another, adding the formula, "the middle of the gulch" (or top of ridge, or high-water mark as the case may be) "being the boundary." In fact, no survey ought to be accepted, either by land owners or by the Government, that does not thus locate every salient point of the boundary, and at the same time prove itself.

NO. 15.

It should be understood that there is no intention in the remarks made in the preceding articles to disparage the procuring and use of the better class of instruments. The aim has solely been to suggest to those who are occasionally engaged in the work, better methods than are likely to be found in books, and to land owners some hints as to whether work done for them is properly done or not. There have lately been in this town two expensive lawsuits, originating in de-

fective surveying—a cause and an effect both desirable to avoid.

The best generally used instrument for all kinds of work in this line is the *five-inch transit theodolite*, either the American form known as the "Surveyor's Transit" or the corresponding English one, made by the leading instrument makers of that country. My own experience favors the latter. The "Solar compass" has some drawbacks connected with its use.

It could be wished that the "azimuth system" of recording bearings were introduced in all descriptions by survey. By this system West is 90°; North 180°; East 270°; all intermediate bearings accordingly. Thus N. 80° W. is 100°; N. 80° E. is 260° and S. 80° E. is 280° and so on. One speedily becomes accustomed to associating in the direction with the figure. The advantages are numerous; in the first place, a great saving of brain labor. The labor of recording is far less, the corrections are uniform, the magnetic azimuth being *always less* in this country than the true. The liability to error by copyists is very much less, one of the most frequent errors occurring now-a-days being the substitution, for instance, of S. 89° W. for N. 89° W. and *id omne genus*. It would not be best to introduce it at pesent, except in giving sights to distant objects, which would accustom observant people to its use.

It is a commendable method to write out or "engross" the notes of survey on the sheet of drawing paper containing the map. Many notes have been lost in consequence of the common method of writing them on a separate sheet. It is somewhat laborious to engross them, but it pays in the end.

Notes of survey should be concise but full, without a single unnecessary word, such as the customary one, "Beginning at the south angle of this"—of course the notes themselves show that it is the south angle. The introduction of the following specimen from an actual case, may be pardoned on account of the combining therein of the different needed elements of certainty:

"Beginning at a rock marked with an arrow, N 17° E true, 250 feet from the head of a waterfall on this land, 'Trig. Sta-

tion No. 2, of ..... bearing 259° 46′ true, distant 4205 feet, and the sharp point of ..... 211° 00′ (N 31° E) the local declination being 7° 30′ E, and running as follows:

1—S 35° 50′ E true, 360 feet along....."," etc.

It will be seen that—first is located the particular spot on the ground; second its place on general maps; third, to a future surveyor coming on the ground on a cloudy day, an immediate means is afforded of fixing the meridian; fourth, the local declination gives a means of finding the peak referred to.

It is not a good way to give both the true and magnetic bearings of the same line. Either one or the other, giving preference of course to the former, always stating which it is that is used. The exact original wording of the surveyor should be always preserved in all documents that embody the same description within themselves.

There are many maps on file in the Interior office that give neither the date nor the name of the author, often times not the name of the district, even the name of the land itself being omitted in a few cases. Everything should be given in full, even the person for whom the survey is made, and the number of the Award or Patent covering it.

1903 Hawaii : The Secretary

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REPORT

OF THE

SURVEYOR

TO THE

GOVERNOR OF THE TERRITORY OF HAWAII

FOR THE

Six Months Ending December 31st

1902

HONOLULU:
THE BULLETIN PUBLISHING CO., LTD.
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1903

REPORT

OF THE

SURVEYOR

OF THE

Territory of Hawaii.

For the Six Months Ending December 31st, 1902.

To HON. S. B. DOLE,

Governor of the Territory of Hawaii,

SIR:—I have the honor to submit to you the following report of the Department of Survey for the six months ending on the 31st day of December, 1902.

The work for the past six months has not differed essentially from the plans referred to in the report for the year ending June 30th, 1902.

FIELD WORK.

HAWAII.

Puna District.

In the Puna District, the Curtis Settlement Association Homestead surveys have been completed. The eight lots, located at 11 1-2 miles, Volcano Road, have been substantially

marked on the ground with large posts, and all division or boundary lines plainly cut through. These lots will average about ten acres each. Map and descriptions of lots are completed.

At 27 Miles, Volcano Road, two large tracts containing an area of 3,600 acres were divided into 18 lots of 200 acres each. This region is covered with a dense forest and a heavy undergrowth of ferns, etc., which is kept exceedingly damp by the numerous showers or daily rains. Much difficulty was experienced in keeping men at work in this section owing to the great amount of rain and consequent coldness in a dense forest at an elevation of over 3,000 feet.

The lots extend from the Volcano Road to a distance of over three miles into the forest. The work on this survey was begun in the latter part of September and was completed the latter part of December. The Assistant has placed substantial posts at all lot corners, cut 26 miles of line through this dense forest, so that the homesteaders will have no difficulty with their boundaries, and has profiled 7 1-2 miles of road.

The plans of these tracts, and the descriptions of the lots have been nearly completed.

Hilo District.

The Kaiwiki Homestead Lots have required adjustment to conform to the new road. This work has taken more time than was at first expected, owing to the discovery of many unfortunate errors in the original survey.

Also some courses and distances were found to have been omitted in the descriptions of these lots, the result of which is that some of them fail to close within 100 feet. A new plan showing the discrepancies between the old and adjusted surveys has been made, which shows the errors in the original work. Work was begun on Piihonua Forest study, but was discontinued in order to complete the Kaiwiki Lot work.

The work in North Hilo has been pressed forward as rapidly as conditions and circumstances would allow.

Part of the mauka Maulua Lots have been readjusted to correct areas, lot lines cut through and the descriptions of the surveys and a plan completed.

A preliminary survey and plan of part of the Upper Laupahoehoe and Kamaee tracts has been made which shows all plantation roads, approximate contour lines, etc.

Profiles of the plantation roads are completed so it will now be an easy matter for the Road Engineer of the Public Works Department to locate roads for the Homestead Tracts. The tract can be quickly subdivided just as soon as this important matter of roads has been decided upon.

Since completing the above work, it became necessary to locate the Government new road which cuts through the Lower Maulua Lots, and to correctly locate the lot corners.

The readjustment of these surveys, some of which had a closing error of from forty to over one hundred feet, is nearly finished.

Kau District.

A complete survey has been finished of the section of Kau extending from the Ahupuaa of Waiohinu on the East to Pakini and Kahuku on the West.

It consists of 21 Ahupuaas containing 42 Grants and 47 Land Commission Awards.

Valuable assistance in arranging the work was derived from a "Map of a Section of Kau showing Ahupuaas, Grants and unsold Government Lands, compiled by F. S. Lyman in 1879."

The lower portion of the Government remnant containing an area of 3,000 acres or more, was cut up into Homestead Lots of sizes varying from 30 to 200 acres. Four roads and branch roads, connecting with the main Government road, were laid out 40 feet wide, with a maximum grade of 6 per cent, giving convenient and easy access to every lot.

The upper portion of the Government land, 5,000 acres or more, was set apart as a Forest Reserve.

The corners of all the lots and every corner touching on the Government land has been marked by a stone bound and mark.

and a pile of stones (ahu), so that there can be no trouble whatever in finding on the ground every corner located on the map. The entire work is thoroughly tied up by triangulation to the primary Triangulation Stations of the Government Survey.

As these primary Triangulation Stations are themselves marked by huge stone ahus, always in place and always ready to be sighted upon at any required distance, no one need spend time in hunting for them or feel any uncertainty about their exact position.

Should the Kona & Kau Railroad pass through or near this section of country, these lots will be greatly enhanced in value. They formerly supported a large population, and if properly developed and improved by bona fide settlers, may yet become the homes of desirable citizens.

After completing the survey of these lots the party of five was joined by two experienced mountaineers, and the aged Kaiwi, who was to serve as a guide, and a start was made on November 27th up the mountain, through the forest, establishing all of the corners, 12 in number, on the boundary of Kahuku on the one side and Kaalaiki, Waiohinu and Kiolakaa on the other.

Mr. Henry Martin, who was thoroughly familiar with every part of the country, joined the party and rendered very efficient and valuable service. The season was unsuited for the work, it being very cold, wet and foggy, and the party was glad to make the descent immediately after thoroughly marking the re-established boundary line, which work was completed on December 10th.

The working sheet and calculation necessary for the completion of the descriptions of the Homestead Lots are well in hand, and the whole work will be completed by the end of January.

Kona District.

The Government remnant or mauka portion of the land of Alika, South Kona, has been laid out into five lots of six hundred acres each.

This required some careful boundary work along the land of Kahuku.

The lot corners have all been marked by a cross on stones, covered by an ahu.

There remain but a few miles of cutting on the division lines to complete the work.

Hilo City Work.

Comparatively little new work has been done under this head during the past six months.

The Road Board has been furnished with the new street lines and grades for such improvements as have been made.

Wailoa Street:

Lines staked, profile run from Front to Wharf Streets and plan furnished.

King Street:

Cross-sectioned and map and study of widening claims finished.

Pukihai:

Road profiled from Scott Street to Arch.

Pitman Street Extension into Puueo:

Line staked on mauka side and several reference points located in street for future work.

Front Street:

Detail survey showing all buildings as far as Kukuau boundary—plan nearly finished.

A complete cross-section survey has been made of the Hilo reservoir site and considerable work done on the grades and location of the new pipe system.

As opportunity offers, the plan of the proposed new street system for Hilo is being advanced. This is based upon systematic block measurements similar to the work in the section East of the Wailoa River.

OAHU.

The work in the outer districts of Oahu has been rather limited and consists only of the new division of the Homestead Lots of Lualualei, Waianae, and the Government remnants in the lower part of Waiahole Valley. The Lualualei Lots, 7 in number, cover an area of over 4,000 acres. The Waiahole remnants consist of 18 pieces, containing an area of 35.78 acres.

As these parcels of land are bounded by numerous small holdings or kuleanas, much care had to be taken in the survey. The established bounds have been marked in the most substantial manner with concrete posts.

Honolulu City Work.

The numerous public and private improvements undertaken in Honolulu during the past six months have called for the services of the Department in various ways.

A general idea of the nature of this may be had from the following:

Lines Marked on Ground for Street Widenings:

Hotel St.	30	ft.
Fort St. mauka of Hotel St.	150	"
King St. Palama Section	3,600	"
Vineyard St.	1,500	"
Liliha St. from Vineyard St. to Judd St.	6,000	"
Liliha St. from Judd St. to Wyllie St.	4,500	"
Waikiki Road	8,000	"
Park Avenue—Kapiolani Park	4,200	"

Curb Lines and Grades:

King St.	1,200	ft.
Beretania Avenue	500	"
Bishop St.	500	"
Fort St.	600	"
Hotel St.	300	"
Kinau St.	2,000	"
Liliha St.	800	"

Pensacola St.	400	ft.
River St.	500	"
Vineyard St.	2,000	"
Emma St.	100	"
Wilder Avenue	700	"

Grades given to H. R. T. & L. Co. for track-laying:

Park Avenue, Kapiolani Park	4,200	ft.
Wiakiki Road	6,000	"

Line given H. R. T. & L. Co. for poles:

Park Avenue, Kapiolani Park	4,200	ft.
Waikiki Road	6,000	"

Street lines marked for fencing, road construction, etc.:

Vineyard St.	3,000	ft.
Park Avenue, Kapiolani Park	4,200	"
Waikiki Road	11,700	"
Wilder Avenue	2,900	"
Fort St. Extension	7,000	"
Liliha St.	300	"
Ala Moana	3,000	"

Waikiki Road line and grade given for fill or road construction has been a rather extensive work, and has taken considerable time at intervals as the work has progressed.

Profiles of the following streets:

Park Avenue	4,200	ft.
Metcalf St.	3,500	"
Dole St. Extension	1,000	"
School St. Extension	1,000	"
McKinley St.	2,600	"
Kukui St.	1,800	"
Proposed Avenue connecting the Lower Section of the "College Hill Tract" with Wilder Avenue, at a point near Alexander St.	2,600	"

There have been 105 building permits acted upon for street line and grade, of which 71 were for stores or buildings in the business part of the city, and the remaining number were for residences.

Cross-section survey of Aala Park and an estimate of material for improvements to a recommended grade. Estimates of material removed from the Park Site under certain agreements, have been made and furnished the Superintendent of Public Works.

As stated in the last report, a carefully planned system of substantial reference monuments is being placed throughout the city, as time will permit.

A very careful work of leveling to the monuments already in, and many other points suitable for Bench Marks has been done, and we now have a series of well-established elevations throughout the entire city and suburbs.

In executing this work, the Engineer divided the city into sections and ran sets of levels around each; thereby obtaining an absolute check which required but little adjustment in finally establishing the Bench Marks.

The section covered extends from Moanalua to Diamond Head and from the Water Front up Kalihi, Nuuanu and Manoa Valleys.

OFFICE WORK.

The office has continued to be of service to the various departments of the Government by furnishing information bearing on many measures under consideration.

Plans, tracings or prints with areas have been furnished the Tax Assessors when applied for. It is necessary for this office to furnish a detail description of every piece of land disposed of by the Government, and in many cases before final disposition is made of the lands, we furnish reports on values.

The increased field work during the past six months has required the preparation of much data in the way of copies of old surveys, boundary certificates, working plans and the like.

The Map of Oahu has been completed in excellent style and finish by our Chief Draftsman, and is now in the hands of the publishers.

The photo-lithographed copies should be here the latter part of January or early in February.

Work is well advanced on a new map of the Island of Kauai, which is being drawn to a scale of 5,000 feet to an inch, the same as the map of Oahu.

A new map of the Puna District will be completed in a week or two. This map is drawn to a scale of 2,000 feet to an inch and will show every land, kuleana, grant and lot in the district, besides the location of the new roads and the Hilo Railroad.

The finished map work or detail sheets of Hilo City Work is progressing slowly, owing to the necessity of employing the force on field work, and the correcting and adjusting of old homestead surveys to avoid delays in the issuing of Patents.

However, a considerable amount of data in the way of accurate detail city work has been compiled, which will be of value when the proposed improvements to the city of Hilo are taken up. Much of this is constantly made use of at the present time.

The miscellaneous work of the office during the past six months includes the following among other items:—

Street Plans and Profiles:

Piikoi Street, King to Sheridan Streets.
Punchbowl Street.
Wilder Avenue, Alexander to Metcalf Sts.
Bingham Street.
Dole Street.
Young Street, Kapiolani St. to Punahou Ave.
Vineyard Street, Liliha to Punchbowl Sts.
Fort Street Extension (School St. to Pauoa Road).
Kuakini Street Extension (Punchbowl St. to Nuuanu Ave.)
Waikiki Road, King St. to Kapiolani Park.
Dominis Street.
Heulu Street.
Kukui Street.
Miller Street.

Seventy-four descriptions of miscellaneous surveys have been furnished and Two Hundred and Six letters written, some of which were reports on land applications, giving areas, values and recommendations.

Forty-two tracing and Two Hundred and Forty-three blue prints have been furnished; some of these have been large sheets of the homestead maps, and were furnished to the Land Commissioner.

Thirty new records have been filed consisting of working sheets, maps and tracings.

In addition to the foregoing, there is a constant demand for a vast amount of information relating to private lands which takes up considerable time of the staff.

The standard time has been obtained from transit observations as heretofore, and the steam whistle signal for local standard and Greenwich time has been given as usual.

Duplicates of the tide records to December 31st, obtained with the automatic tide-gauge in Honolulu Harbor, have been furnished to the Tidal Division of the U. S. Coast and Geodetic Survey.

These records are of special worth, owing to our central location in the Pacific Ocean.

The Meteorologist continues to publish monthly reports of the weather and rainfall, and is having tabulated the records for printing in pamphlet form.

UNFINISHED WORK IN HAND.

Piihonua Forest Survey up to an elevation of 2,100 feet.

Boughellie Settlement Association lots in Olaa at 24-25 Miles, Volcano Road.

Laupahoehoe and Kamaee lots comprising several Settlement Association applications.

Survey of new Government Road through the Waipunalei lots and the adjustment of old lots to same.

Investigation of Honomu Forest Lands by preliminary surveys in order to report on the advisability of cutting this tract up into homesteads.

City work in general, which includes: street lines, grades, proposed street extensions, new streets, etc.

Alika Homesteads in Kona. This tract of 3,000 acres will be completed about January 20th, 1903.

NEW WORK.

The Tax Assessor wishes to replace the tracings in his office with mounted paper maps, for the reason that they are better suited for noting thereon the changes of ownership as they take place.

This will be a rather large work, and will require the constant application of at least one draftsman.

The work for the next period will be practically a continuation of that of the past, though it is very probable that we will find it necessary to do more in establishing and marking on the ground, the boundaries of Government tracts.

It will be necessary to duplicate many of our maps soon, or they will be too much worn and defaced to be of value.

The necessity of having one of the rooms of this office made fire-proof for the protection of valuable records contained therein has been generally recognized and discussed for many years.

Appropriations for this purpose were made by the Legislature some years ago, but unfortunately the work has not been taken up, further than to make plans and obtain estimates of cost of construction.

I would respectfully call your attention to the very great danger these records, which are estimated to be worth over One Million Dollars, are exposed to.

Under present conditions they form a kindling box of the most dangerous character, and I must strongly urge and recommend that the Superintendent of Public Works be requested to petition the Legislature for an appropriation that will be sufficient to make this important improvement, and to replace the wooden cases with metal ones.

EXPENDITURES OF THE SURVEY DEPARTMENT.

During the Six Months Ending December 31, 1902.

	Bal. of Appropriation July 1, 1902.	Drawn.	Balance.
Salary of Surveyor	$ 3,000 00	$ 1,500 00	$ 1,500 00
Salary of Chief Asst.	2,500 00	1,250 00	1,250 00

	July 1, 1902.	Drawn.	Balance.
Salary of First Asst.	2,100 00	1,050 00	1,050 00
Salary of Second Asst. ...	1,800 00	900 00	900 00
Salary of Meteorologist ..	1,500 00	750 00	750 00
Salary of Messenger	600 00	300 00	300 00
Expenses of Survey and Office Work	26,903 02	14,310 41	12,592 61
Publishing Maps	911 04	3 80	907 24
Meteorology	535 50	390 55	144 95
	$39,849 56	$20,454 76	$19,394 80

RECEIPTS.

For Published Maps	$ 33 50	
Tracings	29 00	
Blue Prints	37 00	
Rating Chronometers	10 00	
Data Furnished	60 00	
	$169 50	

ESTIMATED EXPENDITURES OF THE SURVEY DEPARTMENT.

For the Biennial Period 1903-1905.

Salary of Surveyor	$ 7,200 00	
Salary of Chief Assistant	5,400 00	
Salary of First Assistant	4,800 00	
Salary of Second Assistant	4,200 00	
Salary of Meteorologist	3,000 00	
Salary of Messenger	1,200 00	$25,800 00

GENERAL EXPENSES OF SURVEY.

Expenses of Field Parties and Office Work	$48,000 00	
Expenses of Meteorology	1,600 00	
Publishing Maps	300 00	$49,900 00
		$75,700 00

Very respectfully,

WALTER E. WALL,
Surveyor.

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REPORT

OF THE

SURVEYOR

TO THE

GOVERNOR

OF THE

TERRITORY OF HAWAII

FOR THE

Year Ending June 30, 1904

HONOLULU:
HAWAIIAN STAR PRINT
1905

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REPORT

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Year Ending June 30, 1904

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HAWAIIAN STAR PRINT
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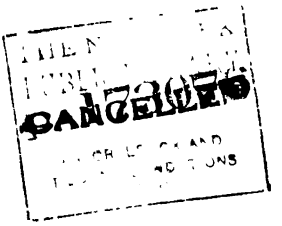
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Report of the Surveyor

TO THE

GOVERNOR

OF THE TERRITORY OF HAWAII

FOR THE YEAR ENDING JUNE 30TH, 1904.

TERRITORY OF HAWAII
SURVEY DEPARTMENT

Honolulu, T. H., July 27th, 1904.

Sir:—In compliance with your request of the 24th ultimo, I have the honor to submit herewith the report of the operations of the Survey Department for the twelve months ending the 30th day of June, 1904.

Very respectfully,

WALTER E. WALL,
Surveyor.

To His Excellency, G. R. Carter,
Governor of the Territory of Hawaii.

ISLAND OF HAWAII.

Puna District.

In the latter part of August, the marking of the Keonepoko homestead lots on the ground was assigned to Assistant J. H. Moragne. Although this land is rocky pahoehoe, and not suitable for agricultural purposes, the lots have been readily taken up on account of their vicinity to Pahoa Village. The Government road running from Pahoa Village to Hilo passes through the center of this tract so that the lots have a good frontage. The lots number twenty-three, and vary in area from 5 to 11 1-2 acres, making a total area of 214.76 acres.

A detail survey was made locating all of the grants in the region from Makuu to the 1840 Lava Flow that passes through the land of Nanawale to the sea shore.

The sea coast was located as far North as Kaloli Point, and a thorough examination made of the land as far back as the Puna branch of the Hilo Railroad.

Mr. Moragne's report showing the land to be rocky, of little value, and quite unsuitable for agricultural purposes, was a disappointment, many having enquired about the unsurveyed tract with a view of obtaining homesteads.

Hilo District.

A preliminary survey was first made of the Kamaee Tract in North Hilo showing location, elevation, topographical features and possible road locations to connect with the government main road. This tract is situated on the north side of the Hakalau Gulch, some two miles above the Government road, at an elevation of 1000 to 1500 feet above sea level and is densely wooded.

The land was then cut up into homesteads for two Settlement Associations; the "Manuhoa," consisting of six lots of over twenty acres apiece, total area 121.1 acres; and the "McKenzie" divided into lots of from 66 to 99 acres, aggregating 551.9 acres.

Besides this a road was run and located upon a six per cent. or less grade from the government main road to the homesteads, a distance of five miles.

The portion of the Laupahoehoe Tract just subdivided, is situated above the cane lands of the Laupahoehoe Sugar Co., and extends to the upper line of the forest, and is almost covered with a dense tree growth.

The portion applied for by settlers being at an elevation of from 1400 to 2000 feet above sea level, is only a small part of this great land.

First a preliminary survey was made, and a plan was drawn showing plantation roads, contour lines and other features; the plantation roads were also profiled.

Forty homesteads have been laid out, having a total area of 950.74 acres. All lot lines have been cut through, and substantially marked posts placed at the corners. A road was also located to connect the homesteads with other roads. The country being very steep and crossed with numerous gulches, the work was thus made somewhat tedious. In all, 8 3-10 miles of roadway were located to grade.

In the latter part of December, the question of the boundary of Lower Kukuau (South) adjoining Waiakea, a Government land, came before Boundary Commissioner F. S. Lyman.

The surveyor for the applicant, Mrs. J. L. Richardson, the owner of Kukuau, and the surveyor representing the Government, made separate and divergent true meridian locations and descriptions of the line between Kukuau and Waiakea.

Prof. C. J. Lyons, an acknowledged expert on surveying methods in these islands, made a report to this Department, in which he held that the Government surveyor's line was the correct one.

The Boundary Commissioner, however, in awarding and certifying to the new certificate of boundary, adopted the location and description of survey made by the applicant's surveyor.

An appeal has been taken to the Supreme Court by the Land Commissioner.

Kohala District.

In November, 1903, an Assistant was detailed to make an examination and study of the boundaries of Kawaihae 2nd affecting those of Kawaihae 1st (Government land), application having been made by the owners of Kawaihae 2nd (Queen Emma Estate) for a boundary certificate.

The testimony of kamaainas was taken who asserted that the

line established by the surveyor for the applicant was too far north and ran into the land of Kawaihae 1st.

The difference in these two lines involved an area of some 383 acres of good grazing land, which should properly have belonged to the Government.

In December, Assistant Kanakanui accompanied J. W. Pratt, Commissioner of Public Lands, and P. L. Weaver, representing the Government, to the sittings of the Boundary Commissioner, at the Kohala Court House. Among other boundary settlements taken up by the commissioner, three certificates affecting Government lands were certified and settled, viz: the lands of Waika, Kahualiilii and Kawaihae 2nd.

The description of Kahualiilii at the request of Mr. Kanakanui was slightly altered to conform with the plan of the land on file in this office.

The description of Kawaihae 2nd was also amended in the boundary certificate, which placed the disputed 383 acres in the Government land of Kawaihae 1st.

In February, 1904, Mr. Kanakanui was sent to make a survey of the Pololu Bottom Lands and the boundaries of the Ili of Pau, owned by A. S. Cleghorn, Esq.

This survey was made on the request of the Land Commissioner who was of the opinion that more land was included in the Boundary Certificate description than belonged to the Ili. The new survey, executed with extreme care after a thorough study of the matter, shows that 23 acres of first class rice land which belonged to the Government was included in the Ili. The extent of this loss to the Government is estimated at from $6000 to $7000.

Government Survey Registered Map No. 2247, gives the results of this careful survey and study.

Government remnants in the lands of Puepa 2, Kokoiki and Awalua were surveyed, amounting altogether to about 600 acres.

Kau District.

A survey and study of the Keauhou-Kapapala boundary was made in May, 1903, by Assistant E. D. Baldwin, as mentioned in the last annual report of this Department.

In August, 1903, Mr. Baldwin put in a concrete block and galvanized pipe at Lydgate's pile of stones near Uwekahuna on

the northwest side of the crater of Kilauea, and substantially marked this boundary line with piles of stones (ahu), as far as the large Kipuka on the east slopes of Mauna Loa. At this point two line posts were driven in, so that the line can be extended across the Kipuka and up to the island in the aa flow, whenever required. This work was made in connection with the Bishop Estate who paid half the expenses.

Assistant J. S. Emerson left Honolulu the latter part of June, 1903, reaching Naalehu, Kau, on June 28th. The next day a party including one of the boundary commissioners for the District of Kau with Mr. H. K. Martin, the veteran mountaineer as guide, was organized. The three following days were spent in the saddle and on foot, visiting every point on the Kahuku line from the end of the Pahala forest reserve fence to the vicinity of the Akihi Trig. Station. The object was to have the official representative of the Government Survey point out the boundary line which had already been marked on the ground. This was successfully done, at the cost of extreme fatigue.

From this time to the middle of August, Mr. Emerson was busily engaged surveying Government lands leased to the Pahala Plantation. The pieces included one of 186 acres in Makaka, 218 acres in Iliokaloa-Wailoa Tract, and 700 acres in Moaula-Paauau Tract. The survey of the last two tracts included the location of the new flume line so far as completed through the woods, for a distance of 2 1-4 miles. This flume marks the lower boundary of the proposed forest reservation and will greatly increase the area of land that can be irrigated for cane. The upper limit of the cane fields in Mohokea 1 and 2 and the site of a proposed natural reservoir in Moaula were also surveyed. All the above work is shown on map of Pahala Plantation, Registered No. 1837.

After the above work was completed, Mr. Emerson surveyed the Government remnant in Puueo, area 318 1-2 acres; and then returned to Honolulu.

Hilo City Work.

Considerable new street line work was called for during the past year, by the proposed widening of Wailoa and Front streets and Bridge Street Extension into Puueo.

A survey and title study was made on all claims in the widening of Wailoa Street, the Wailoa Water Front claims, Bridge Street proposed extension, and the claims arising from the widening of Front Street to a width of 80 feet.

This last was an important work on account of the conditions of the different titles, and the sea accretions during the last fifty years.

The new Front Street line was also staked out on the ground, extending from Waianuenue Street to Waiakea Bridge.

The Wailuku and Waiakea River bridge abutments were staked out for the contractors, and as the work progressed, were tested for line and grade.

Besides this, line and grade were given for the construction of curbs, fences and buildings wherever needed.

Hilo Office Work.

In the office, much map work has been done, especially of Hilo city blocks, proposed street improvements, and profiles of all the streets which have been drawn on a scale of 1 inch to 40 feet,, and a general contour map of the main portion of the town on a scale of 1 inch to 200 feet showing differences of every five feet in elevation. All of the above being used by the Public Works Department in planning a sewerage system for Hilo.

Maps are also made of all work done in the field such as the Puna survey, Keonepoko lots, Kamaee homesteads, Laupahoehoe homesteads, etc.

A reference Bench Mark book has just been completed giving all bench marks under each street heading, so that whenever a bench mark is needed in town, it can be easily found.

The following tracings have been finished and furnished:

3 Waipunalei readjusted homested lots.
1 Makuu Region, Puna. Detailed map.
2 Honomu Forest lands.
3 Piihonua Forest lands.
2 Puepa 2, Awalua, etc. Kohala Govt. Remnants.
2 Proposed Wailoa Street improvement.
4 Proposed Front Street improvement.
1 Bridge Street. North side of Wailuku bridge.
2 Keauhou-Kapapala Boundary, showing adopted lines and descriptions.
3 Manuhoa Settlement Association. Kamaee Tract.
3 McKenzie Settlement Association. Kamaee Tract.
1 Kamaee Tract. Proposed road.
1 Olaa Homestead Reservation Lots.
2 Olaa proposed roads.
1 Hilo City and vicinity for the Board of Trade.
1 Hilo Park for the Landscape Gardener.

1 Proposed Hilo Police Signal Plan for Sheriff Andrews.
3 Proposed Hilo Armory sites for Captain Fetter.
1 Hilo Swamp Lands to Board of Health.
1 Proposed widening of Pitman St. through Puueo to Hilo Sugar Company.

Several small tracings of portions of Front and Wailoa streets for claim settlements to Hilo Road Board.

1 Map. Keonepoko, Puna, Homestead lots.

Description of surveys finished and furnished in duplicate:

23 lots Waipunalei readjusted surveys.
5 claims Wailoa street widening.
10 claims Front street widening.
2 exchange lots for street widening.
2 descriptions Govt. Remnants in lands of Puepa 2 and Awalua, etc.
13 lots Kamaee Tract. Manuhoa and McKenzie Settlement Associations.
42 lots Kaimu-Makena-Kiula Tract, Puna.
6 lots Kaimu-Kalapana mauka Tract, Puna.
33 lots Kikala-Keokea Tract, Puna.
24 lots Kamaili-Keauohana Tract, Puna.
9 lots Kaniahiku Tract, Puna.
5 lots Malama Tract, Puna.
23 lots Keonepoko Tract, Puna.

The office work includes also, the writing of reports on lands, boundaries, etc., studies, calculations and the preparation of data for the field parties, and the furnishing of information as to land matters, to the public.

ISLAND OF MAUI.

Kahikinui Lantana Line.

This line, over six miles in length, was run at the request of the Land Commissioner, who had made an agreement with Dr. Raymond, owner of the Kahikinui Ranch, that all lantana above the line, should be cleared by the latter. This work was commenced on the 1st of July and was finished by the 16th.

Koolau District.

The latter part of July and the months of August, September and October were devoted to several surveys in this district.

The first work taken up was that of Keanae Flat (mauka.) It was at first intended to divide this land into homesteads, but later

the Land Commissioner decided that the subdivision be postponed. However, a detail survey was made, showing the topographical features, boundaries, area of the agricultural land, etc. The Government agricultural land consists of 672 acres.

A detail survey of Keanae Flat (makai) was also made, showing kuleanas, grants, etc., and Government remnants. This work had been commenced by Mr. Howell some four years ago, and he very kindly gave his working sheet to the Government survey party. The Government remnants aggregate 22.54 acres of kula land, and 12.47 acres of rice and taro land.

A detail survey was made of Wailua-nui Flat for the Land Office, showing the area of the rice and taro lands leased by the Government (tenancy at will); so that the Sub-agent may be able to fix the rentals, as taro lands bring in higher rents than kula lands. The area was found to be 32.5 acres.

When the above mentioned was finished, the survey of Puakea and Paakea was taken up. The owner of Puakea and Paakea, Mrs. Acheong, being doubtful as to the lines as located by Mr. Hugh Howell, requested the Government surveyors to re-survey these lands. Considerable testimony was collected and a careful survey was made, according to the evidence and original descriptions, resulting in a complete check on Mr. Howell's survey which was found to be correct.

Locations of the new road through this section was made at the same time to identify the points where this road ran through Lot 39 of the Nahiku homesteads. The boundaries of Lots 38 and 39 were also run out.

Kula District.

After the work in Koolau was completed, the party went to Kula, to subdivide the Omaopio Tract into homesteads; but before work was commenced these orders were countermanded and directions were given to proceed on the work of running the Kula forest line.

Starting from Kamaole, right above the corn belt, two forest lines were run towards Waiakoa. One line ran from an elevation of 4200 feet to an elevation of 4300 feet; the other from 4800 feet to 4300 feet; each being about four miles long.

Lahaina District.

Quite a lot of work has been done in Lahaina, over the Government school grants and Lahainaluna School lands.

In November, 1903, Mr. Geo. F. Wright was ordered to make a survey of the upper portion of the land of Kuia, occupied and used as a part of the Lahainaluna Seminary premises.

Of the 951 acres in this piece, the most of it is good ior pasturage only.

A controversy having arisen between the Department of Public Instruction and the Pioneer Mill Co. as to the water privileges in Kanaha Valley, and the case being brought before the Commissioner of Private Ways and Water Rights, the Attorney General's Department requested this office to make a location of lands entitled to water privileges in this valley, so that it could ascertain and determine the extent of the Government's (the Lahainaluna School lands), and the Pioneer Mill's rights in the matter.

A title search was made of the Lahainaluna School properties, of the lands as well as the water rights, and information of value to the Government was furnished the Attorney General.

That part of the Lahainaluna School land ,now planted in cane, was also located. It was found that the Pioneer Mill Co. had been using 45 acres more than it had been paying rent for.

During his stay in Lahaina, Assistant Kanakanui also made locations of the different school grants, at the request of the Attorney General in person, for the Department of Public Instruction. There were ten school grants scattered over the town of Lahaina; two of which had been sold by the Commissioner of Public Lands, one in possession of R. P. Hose, one being used as a cemetery and the other six had been planted in cane by the Pioneer Mill Co., for the past nineteen years, without any right and without paying any rent.

ISLAND OF LANAI.

In October, Assistant F. E. Harvey, was sent to Lanai to make a preliminary survey of the Government Lands on the south side of the island preparatory to a proposed subdivision into homesteads to encourage sisal farming.

The first thing done was to recover the old triangulation stations and to continue the triangulation of the island.

Of the three primary stations on this island, Puu Manu, marked by a concrete post, was the only one found in good condition. The red wood post marking Kanepuu had rotted away but the hole was identified and this station was re-marked with a cross on a large stone and an ahu. Pohoula was originally marked

by a buried copper triangle; this was not found, but the iron stakes which were used to hold the guy ropes of the original barrel signal were found, and this station was also re-marked by a stone with a cross on it.

A good deal of triangulation was necessary before the running of the ahupuaas was practical. The base for this work was the distance and azimuth between primary station Puu Manu and secondary station Puu Alii. This was found to do very well, as several measured distances checked closely.

The boundaries of all the ahupuaas on the leeward side of the island were then run out, beginning with the ahupuaa of Palawai and including part of Kaohai, Kamao, Pawili and Kealiaaupuni, Kealiakapu, Kaunolu, Kalulu, Kamoku and part of Paomai. In all the boundary work, all the old points and corners which were marked by crosses or other marks on stones were recovered, but not one of the other points, mostly marked by triangular pits could be found. This work was very difficult and tedious, the coast being a very hard country to travel over and all the boundaries run from the central part of the island to the sea. It took just about two months to finish this work.

The next month was devoted to surveying, locating and marking the kuleanas and grants within these ahupuaas.

It became evident that the land would not be taken up for sisal farms, and as orders stopping the work came about this time, Mr. Harvey returned to Honolulu, arriving on the 26th of December.

ISLAND OF NIIHAU.

In December, 1903, S. M. Kerns was detailed to assist Prof. W. D. Alexander, Assistant U. S. Coast and Geodetic Survey, in connecting the island of Niihau to Kauai by triangulation. Mr. Kearns also made a complete topographical survey of the island, the first one made by triangulation and the only correct one. Its shape is altogether different from previous maps and plans, and the areas do not agree very closely. The area found by the new survey is 46,575 acres.

A plan, tracing, triangulation sketch of Niihau, and a triangulation sketch of Niihau and a portion of Kauai, showing the points connected on the two islands, were furnished to the U. S. Coast and Geodetic Survey. The sea coast of the island located in this survey measures forty-eight miles.

ISLAND OF KAUAI.

The work on Kauai has consisted chiefly of surveys for the Commissioner of Public Lands.

The Government remnant in Hanalei, known as the school lot, and the approaches to the Kalihiwai Bridge through the Wilcox land and a kuleana owned by an Hawaiian were surveyed for the Superintendent of Public Works in order to complete the Government-Wilcox exchange.

The Government remnant in Waioli was surveyed preparatory to being subdivided into houuse lots.

The taro and rice lands in upper Hanalei were surveyed and staked out, so as to give all applicants both kula and taro land. The descriptions and plans of the lots have not yet been completed.

The land of Puupehu (Crown) in Hanalei, was looked over. Fully seventy-five per cent. of it is covered with an impenetrable thicket of lantana and guava, most of which if cleared will be good pasture land.

A description and plan of the Chinese burial plot in Kapaa, was furnished to the Land Commissioner.

ISLAND OF OAHU.

The chief work on Oahu, during the past year, outside of Honolulu City work, has been the survey of Kaipapau Valley, the staking out of the Hauula Beach lots, and the preliminary survey of the proposed Pupukea-Paumalu homesteads, all in the district of Koolauloa.

The Hauula Beach lots were staked out by Mr. F. L. Lowell in July, 1903, and as the title indicates, are situated on the beach. There are 13 lots with a total area of 4 acres.

In August, Mr. Lowell made a preliminary study of Kaipapau Valley, which is situated between Laie and Hauula. This is a Government land, and had never been surveyed; it is a long, narrow valley, running back to the main Koolau range, and might be called a gorge. It is covered with a heavy vegetation, valueless for homesteads, the sides being too steep, and it is questionable if the watershed at its head is of any value, as it

would be very costly to develope and store the water. The plantation on the lower lands is well equipped with pumping stations and would hardly care to go to that expense.

After the lines had been cut along the two ridges, (the boundary of the valley), under the direction of Mr. R. D. King, Sub-Assistant, Mr. Lowell returned and finished the survey. Total area 1195 acres.

Owing to the complications arising in the disposal of this land, several descriptions of various parts of the valley were furnished to the Superintendent of Public Works.

During the months of February and March, 1904, the preliminary survey of the proposed Pupukea-Paumalu homesteads was completed and mapped. This land is crossed by several gulches in which running water is to be found during the rainy seasons, and there are several small springs from which water can be had throughout the year. The soil is very good, and the only problem for the homesteaders to solve, will be the water supply during the dry months. A portion of the land up towards the mountains will be reserved for forest purposes.

In June, it was finally decided to cut up the land into homesteads, and Mr. Wright is now occupied in the subdivision of the lots, and the locating and profiling of suitable roads. In all these is about 4000 acres of available land.

Hauula Fish Pond, Hauula, Koolauloa, was surveyed, and a description and plan furnished to the Land Office. Its area is 33,789 square feet.

The boundary between Tantalus and Manoa Valley was made the subject of a thorough study, the results of which were embodied in a description and tracing furnished to F. S. Dodge, Esq., Agent of the B. P. Bishop Estate, owners of land abutting the Government property known as "Tantalus Heights."

A survey, plan and description was made of the Diamond Head Lighthouse reservation for the U. S. Lighthouse Board. Area 2 acres.

A survey, plan and description was made of the Ili of Kahaumakaawe, in Manoa Valley, by G. F. Wright, and a title study was made by S. M. Kanakanui.

A survey, plan and description was made of the Weloka Fish Pond, situated at Ewa. Area 26.5 acres.

A location was made of all the bulkheads and sea walls along the Waikiki Beach, from Kapua to Piinaio Stream; and a title study of the properties fronting the shore, to see whether property owners had exceeded their lines and encroached on the public domain. This was for the Superintendent of Public Works who desired to furnish data to the Attorney General's Department.

A survey of Kanohuluiwi Government remnants and fish pond, in Kaneohe, was made. It consists of 3.05 acres of fish pond, 3.20 acres of kula land and 1.2 acres of rice land.

HONOLULU CITY WORK.

The engineering branch of the Department has been kept busy giving grades and lines for streets, car tracks, bridges, fencing and road construction, cross sections for the filling and cutting of street extensions and other work necessary in city engineering.

The following gives an idea of the nature and amount of work in the past year:

Lines Marked on Ground for Street Widenings and Extensions:

Nuuanu Avenue from Hotel Street to Pauahi Street Ext.
Fort Street Old Waterhouse Store.
Fort Street in front of I. O. O. F. property.
King Street in front of Dowsett property.
King street South Street east 900 feet.
Union Street corner Beretania Avenue, south.
Bethel Street.
Hotel Street.
Miller Street in front of Methodist Church.
Kukui Street Extension from College Walk to Liliha street.
Bates Street Extension from Nuuanu Avenue to Liliha Street.
School Street Widening from Punchbowl Street west 800 feet.
School Street Extension Liliha Street to Kalihi Road.

Street Lines and Grades for Fencing, Road Construction, Etc.

	Feet.
Kapahulu Road (for Water Works Bureau)	4700
Luso Street from Alapai Street to Miller Street	5200
Iwilei Street King Street to Prison	1800
Iwilei Street	750
Young Street, Keeaumoku Street west	1000
Young Street	2500

	Feet.
Queen Street west of South Street	700
Pauahi Street	1300
Pauahi Street Extension	920
Fort Street Extension	2500
Hastings Street	1200
Kawaiahao and Chamberlain Streets	2000
School Street	1000
Dominis Street	600
Total	26170

Curb Lines and Grades:	Feet.
Alakea Street	225
Beretania Avenue	1500
Bingham Street	225
Dominis Street	325
Fort Street	1175
Green Street	300
Hotel Street Extension	1175
Iwilei Street	1940
Kakaako Street	475
Kekaulike Street	550
King Street	6890
Nuuanu Avenue	700
Punahou Avenue	400
Pensacola Street	550
Piikoi Street	1500
Punchbowl Street	585
Pauahi Street	920
Queen Street	1985
South Street	2075
Smith Street	350
School Street	890
Thurston Avenue	525
Union Street	370
Victoria Street	225
Vineyard Street	2250
Waikiki Road	3000
Wilder Avenue	320
Waikamalo Road	1000
Young Street	2985
Total	35410

Grades run and profiles made:

	Feet.
Oahu Avenue Extension (2 routes)	4000
Nuuanu Avenue	600
Metcalf Street	1900
Wyllie Street Nuuanu Avenue to end	2900
Piikoi Street Wilder Avenue to Pensacola Street	900
Hotel Street Ext. check on H. R. T. & L. Co. track	1300
College Walk	1240
River Street	2040
Punchbowl Street	1950
Bates Street Extension	2000
Beretania Avenue	1800
School Street Extension Liliha Street to Kalihi Road	6130
Fort Street Extension	2300
Waikamalo Road near Kalihi Pumping Station	500
Iwilei Street Loop	5000
Total	34560

Cross Sections:

Old Stone Quarry: Normal School Site. N. cor. Hackfeld and Quarry.

Vicinity of the Iwilei Oil Tanks.

Proposed Armory Site King St. opposite Executive Building.

New Government Stables, Kakaako.

Queen Street Extension. Cut and fills calculated for construction.

Fort Street Extension. Cut and fills calculated for construction.

Lines and Grades given for H. R. T. & L. Co. Track:

	Feet.
Beretania Avenue	11000
Alexander Street	600
Kaimuki Branch, including King St., Beretania Ave. and Waialae Road	10620
Total	22220

Lines for H. R. T. & L. Co., Electric Light and Telephone Poles

	Feet.
Beretania Avenue	22000
Alexander Street	1200

	Feet
Liliha Street Judd Street north	1200
Queen Street, South Street to Ward Street	1800
Iwilei Street	1500
Waialae Road	200
Total	27900

Miscellaneous Surveys:

Aala Park water system.
For sewer through McLeod's lane, from Kukui to Vineyard streets.
Asylum Grounds and vicinity.
Location Govt. Taro lands adjoining Insane Asylum grounds.
Kunawai Lane, off from Liliha Street.
Achi Lane, mauka from Beretania Avenue.
Queen Street Extension Nuuanu River to Iwilei Street.
Kakaako Street Extension from Halekauwila St. Ext. south.
Iwilei Street Extension.
Oahu Avenue Extension two routes to connect with the Manoa Valley Road.
Metcalf Street Extension.
Nuuanu Avenue Pauahi to Hotel Streets.
Waikiki Road and King Street—corner.
Metcalf Street Wilder Avenue to east end.
Wyllie Street.
Queen Street Alakea to Fort Streets.
Title study of Galt lot on Liliha Street.
Kewalo-Auwaiolimu Boundary for Agricultural Experiment Station.
Government Stables, Kakaako.
Staking Palama Pumping Plant Site.
Location of School St. Ext. from Liliha St. to Kalihi Road.
Government Remnant in Pauoa Valley.
Post Office Block.
Lot on Fort St., near Vineyard St. sold to Mrs. Rose.
Waialae Road. 9000 feet long.
Kunawai Government land.
J. B. Castle lot junction of Fort and Kuakini Street Exts.
Kalihi-kai. Bishop Estate lease to Government.
Cultivated land, slopes of Round Top.
Kapahulu Road. 5750 feet.
Monsarrat Road. 2800 feet.
Staking Govt. lot, Pauoa Valley, for exchange.

Insane Asylum elevations.
Kaakaukukui elevations.
Staked out Kalihi Quarry.
Staked out Pauoa Quarry.
Staking and running out Achi Lane.
Surface area between curbs Queen St. Alakea to Fort Sts.
Renjes' lot, School Street Ext.
Oahu Avenue Extension re-survey.
Levels Normal School Site.
Bates Street widening. Bishop Willis and Govt. exchange.
School Street widening. Punchbowl to Fort Sts.
Dreier lot, location of bulkhead, Waikiki.
Kalihi Quarry.
Lot adjoining Insane Asylum.
Pahoa Water Works lot, Kapahulu Road.

Monuments. (Permanent systematic street marks.)

West corner of Judd Street and Nuuanu Avenue.
North Corner of King Street and Gulick Street.

Beretania Avenue.
Alapai Street east corner.
Kapiolani Street east corner.
Victoria Street east corner.
Piikoi Street east corner.
Punahou Avenue, north corner.

Hotel Street.
Alapai Street east corner.
Kapiolani Street south side of street.

Young Street.
Victoria Street east corner.
Piikoi Street east corner.
Keeaumoku Street north corner.

King Street.
Alapai Street east corner.
Victoria Street east corner.
Piikoi Street east corner.
Keeaumoku Street, north corner.
Waikiki Road north side of King Street opp. Waikiki Rd.
Punahou Avenue north corner.

Line and grade was given for 27 new buildings, amounting in all to 2540 feet.

All catch basins for storm sewers are given the proper grade by this office, before they are put in.

HONOLULU OFFICE WORK.

All surveys made in the field are always mapped in the office, the important ones are registered and filed for reference.

Following is a list of the maps registered during the past twelve months:

Papaloa, Pauoa Valley.....Scale 1 in. to 50 ft.
Oahu Avenue, Manoa Valley.....1 in. to 50 ft.
Kahakuloa, West Maui.....1 in. to 500 ft.
Kaiwiki Lots, Hilo, Hawaii.....1 in. to 200 ft.
Kaiwiki Homesteads, Hilo, Hawaii.....1 in. to 500 ft.
Hana Landing and vicinity, East Maui.....1 in. to 100 ft.
Front Street (Improvement), Hilo, Hawaii (2)..1 in. to 40 ft.
Kalihi Valley (Upper section), Kona, Oahu....1 in. to 500 ft.
Olohena, Kaui.....1 in. to 20 ch
Kuia, Lahaina, Maui.....1 in. to 500 ft.
Mauka portion Kuia, Lahaina, Maui.....1 in. to 500 ft.
Diamond Head Lighthouse Site Kaalawai, Oahu.1 in. to 100 ft.
Honolulu Government Lands.....1 in. to 1000 ft.
Kaipapau, Koolauloa, Oahu.....1 in to 1000 ft.
Post Office Site, Honolulu.....1 in. to 20 ft.
Kaipapau Triangulation Sheet, Oahu.....1 in. to 1000 ft.
Kahaumakaawe, Manoa, Oahu.....1 in. to 50 ft.
Detention Camp Site, Kapalama, Oahu.....1 in. to 100 ft.
Kanoahuluiwi Govt. Ili, Kaneohe, Oahu.....1 in. to 100 ft.
Kamaee, N. Hilo, Hawaii. (Manuhoa Sett. Ass.).1 in. to 200 ft.
Kamaee, N. Hilo, Hawaii. (McKenzie Sett. Ass.).1 in. to 500 ft.
Kamaee Tract Roads, N. Hilo, Hawaii.....1 in. to 500 ft.
Portion of the Island of Lanai.....1 in. to 1000 ft.
Lanai Triangulation .....1 in. to 2000 ft.
Alexander St. Extension, Honolulu, Oahu.....1 in. to 20 ft.
Kawaihae 2nd., South Kohala, Hawaii.....1 in. to 1000 ft.
Kahualiilii and Waika, N. Kohala, Hawaii.....1 in. to 1000 ft.
Kawailoa, Waialua, Oahu. L. C. A. 7342.....1 in. to 50 ft.
Tantalus-Manoa Boundary Oahu.....1 in. to 200 ft.
Wailua, Koolau, Maui.....1 in. to 200 ft.
Keanae Flat mauka, Koolau, Maui.....1 in. to 500 ft.
Keanae Flat makai, Koolau, Maui.....1 in. to 100 ft.
Puakea and Paakea, Koolau, Maui.....1 in. to 500 ft.
Kamaole, Kula, Maui.....1 in. to 500 ft.
Alae 3-4 Homesteads, Kula, Maui.....1 in. to 500 ft.
Kaalawai, Diamond Head Slopes, Oahu.....1 in. to 50 ft.
Fort and Kuakini Streets, Castle Lot, Honolulu.1 in. to 20 ft.

Round Top Slopes, Makiki, Honolulu.....1 in. to 200 ft.
Waialae Road Plan, Honolulu.....1 in. to 50 ft.
Aiea (makai), Ewa, Oahu.....1 in. to 100 ft.
Kunawai Springs, Honolulu.....1 in. to 20 ft.
Pololu, Kohala, Hawaii.....1 in. to 200 ft.
Island of Niihau.....1 in. to 2000 ft.
Olaa Homesteads, Puna.....1 in. to 1000 ft.
School Street Extension. Liliha St. to Kalihi Rd. 1 in. to 100 ft.
Pupukea-Paumalu, Oahu.....1 in. to 500 ft.
Kaauhuhu, N. Kohala, Hawaii.....1 in. to 300 ft.

Profile maps of the following streets, showing position and elevation of car tracks, sewers and sidewalks when such exist, were drawn for the Grade Commissioners:
Wyllie Street
School Street
Pauahi Street
Maunakea Street
Metcalf Street
Ala Moana
Kekaulike Street

Miscellaneous office work deserving special mention:

A compiled tracing of Honolulu was furnished to the Water Works Bureau, in order that the pipe lines of the city might be marked thereon. This plan is on a scale of 1 inch to 500 feet.

The Tax Bureau made an application for data of all lands on the island of Oahu. Blue prints of the following lands, showing grants, kuleanas and names were furnished:
Maunawili
Kaneohe
Waikiki
Punaluu and Kaluanui
Waialee
Kapalama
Waikane (2)
Kahaluu
Kalia
Hakipuu
Kaipapau Valley
Kailua
Kahuku (8)

Kalihi
Hauula
Waialua (4)
Kaena
Waianae
Manoa Valley
Palolo Valley
Nuuanu Valley (2)
Pauoa Valley (2)

A set of the published maps of Oahu, Kauai, Molokai and Maui was given to the Superintendent of Forestry. Besides this, plans of the Nuuanu Valley watershed, the Makiki Valley watershed, Puuanahulu Park Reserve, Tantalus Heights Park Reserve, Punchbowl Park Reserve and Hilo Park Reserve were furnished to the Bureau of Agriculture and Forestry.

The U. S. Weather Bureau was sent a set of maps of the islands with all the weather observation stations shown on them.

A set of maps of this islands with the districts shown in different colors, and relief maps of Oahu and Maui were loaned to the Hawaii Promotion Committee for exhibition in its rooms.

A map of Honolulu colored so as to show the Government remnants in the city was sent to the Superintendent of Public Works.

The local standard time has been obtained from observations with the transit and furnished to the public, as well as the Greenwich time for navigators.

All Government deeds and exchanges and grants have been copied from the records of the Public Works and Land offices, and plotted and marked on the maps of this office.

An elaborate system of card indexing has been planned and will be inaugurated during the coming year.

One hundred and fifty-nine building permits have been acted and reported upon.

Mr. S. M. Kanakanui on his return from Lahaina made an exhaustive and complete title search for Government remnants in Lahaina town. He found twenty-five pieces scattered about the town, with an aggregate area of 53.51 acres.

Number of maps, tracings and charts registered and filed .....65.—Total 2253
Number of copies of surveys furnished (including homestead surveys).....203
Number of field books registered and filed..... 50
Number of tracings furnished (not including tracings and sketch plans attached to copies of surveys furnished)..124
Number of blue prints furnished.....345
Number of reports and official letters.....390

In early December, 1903, this office was requested to furnish descriptions of lighthouse sites throughout the islands for the use of the U. S. Lighthouse Board.

This necessitated some field work, but in a short time notes of survey of lighthouse sites and the geographical position of all lights maintained at Government expense were ready and transmitted to the Governor.

UNFINISHED WORK ON HAND.

Laupahoehoe Homestead Map and descriptions.

Block maps of Hilo city, plans for street extensions, widenings, grades, etc. General map of "Hilo and vicinity" on a scale of one inch to five hundred feet.

There are a few corners to mark in the Brughellie Settlement Association lots in Olaa before the tract is tied up to adjacent surveys as a final check.

Homesteads in Hanalei Valley, Kauai and the Puupehu pasture lands in the vicinity containing an area of over 2000 acres.

The locating and marking of the recently established forest reservation in the Halelea and Koolau districts, Kauai.

NEW WORK.

The new work for the present period is not likely to differ essentially from that of the past year. The Land Commissioner takes up all applications on land matters with dispatch which often necessitates work on our part.

The various contemplated public and private improvements are certain to make a considerable amount of city work for us.

As apportunity offers we will need to duplicate some of the badly worn records of the office. A few of the more valuable maps which have become very much broken and defaced by constant consultation will require prompt attention.

Our Chief Assistant, Olaf L. Sorenson, who has had charge of the Honolulu City and Office work, intends to continue the systematic placing of street monuments in such a manner as to eventually put the entire work in first class condition.

It has been the hard work of the past in clearing off much of the inferior old surveys that now makes it possible to accomplish so much more at the present time. The new reference marks will still further add to the ease in which city surveys may be made by both private and government surveyors. I regret to report that there seems to be but little or no regard given by some people to surveyor's monuments unless constructed in the most substantial manner. It would seem that these persons take pleasure in destroying marks that are of great value to property owners. I would respectfully recommend that legislation be obtained to properly protect the government and private land marks.

It is my opinion that the public would be given only due consideration if private owners of land offering subdivisions for sale, should first be required to obtain the approval of the Superintendent of Public Works to the road locations, etc., of their tracts.

Up to this time, with but few exceptions, the various tracts have been laid out without regard to present or proposed permanent improvements. The results are that the street systems do not connect well, roadways lack the proper width, and when adjustments are made, it is generally at the expense of the government.

As the city water system is extended to such tracts, electric lights furnished and the roads macadamized, they become a part of the city improvements.

We are sometimes put to unnecessary trouble in looking up data when called upon to do work in these subdivisions.

The plans filed with the Registrar seldom ever contain enough data to enable one to re-establish the street lines, etc., shown thereon. If a law were enacted requiring such maps or plans to show enough data to make is possible to establish the lines on the ground, it would not only be a convenience to the property holders and private surveyors, but would also be the means of saving the Government surveyors time and expense when required to furnish street lines, grades, etc.

Through the courtesy of private surveyors ,this Department has obtained, from time to time, much valuable data in the way of copies of private surveys other than the ones referred to above.

Although the U. S. Weather Bureau intended to assume charge of the weather service here on the 1st of July, it was found to be impracticable owing to the late arrival of Director A. M. Ashley, and the many difficulties and delays experienced by him in obtaining satisfactory offices.

To avoid a break in the long series of meteorological observations, Mr. Lydecker has kindly offered to continue the work without pay for the short time that will be necessary until the U. S. Weather Bureau begins the new service.

The details of the work of the year given in the foregoing pages is quite complete, but it does not include all of the items that might be mentioned. It is perhaps enough to say that statements made in previous reports showing how much time is devoted to persons applying for information on land matters, compiling data for departments of the Government, for field parties, etc., etc., apply to this year's work also.

It is gratifying to say that the progress made during the year will make it possible for the Department to give the public a good service, notwithstanding the limited appropriations and reduced staff due to retrenchment.

The statement of receipts and expenditures follow.

Expenditures and Receipts of the Survey Department for the twelve months ending June 30, 1904.

EXPENDITURES.

Salary of Surveyor	$ 3000 00
Salary of Chief Assistant	2500 00
Salary of First Assistant	2100 00
Salary of Second Assistant	1800 00
Salary of Meteorologist	1500 00
Salary of Messenger	600 00
Expenses of Field Parties and Office work	21,190 71
Meteorology	909 75
Publishing Maps	147 50
Total	$33,749 96

RECEIPTS.

Sales of Published Maps	$ 189 50
Blue Prints	32 35
Tracings	33 00
Rating Chronometers	13 00
Data furnished	3 50
Professional services	131 25
	$ 402 60

DEPARTMENT OF SURVEY.—Meteorological Office.

REPORT OF THE METEOROLOGIST.

APPENDIX NO. 1.

Honolulu, June 30, 1904

Sir:—I have the honor to submit the following brief report of the work of this office for the year ending June 30th, 1904.

Records of daily rainfall have been received from forty-four stations on the Island of Hawaii, thirty-nine reporting for the full year, the others having been established during that time, and on account of the sickness of the observer, one station, not included in the above figures was discontinued. Twelve stations have reported from Maui, being one less than the previous year. A station was established in October, 1903, at Keomoku, Lanai, and reports have been received regularly since then, this being the only station on that island. Twenty-seven stations on Oahu have made full reports for the year, and two stations discontinued with but partial records. The island of Kauai has furnished reports from fifteen stations for the full year and two were discontinued after a few months, making a total for the group of ninety-nine rain-record stations reporting at the close of the year.

Six observers on Hawaii are furnished with maximum and minimum thermometers, four of whom have reported for the full year, one dropped out after ten months service and the other began only in January, 1904.

One observer reports from Lanai, one from Maui, and four on Oahu, making a total of eleven temperature reports. Several of these observers report direction of wind and brief notes on the weather. Three observers also make daily observations of humidity and one, in addition to the foregoing, barometer readings.

The observations at the central office at 1508 Alexander street Honolulu, have been kept up in the usual way, involving thirty-nine entries a day. This closes the twenty-first year of the series. The publication of these observations, as well as those at the out stations, in permanent form begins with the year 1892, and ends with the year 1903. What steps will be taken in reference to the publication of the records from January 1st, of the present year until the United States Weather Bureau assumes charge of the service, a subject which will be referred to in a succeeding paragraph, has not yet been decided.

Every month a summary, including the averages and extremes, and comparison with normal meteorological conditions was published in the local papers. This includes also the average temperature and other items from outside stations, especially the percentage of district rainfall as compared with the normal. One paper also publishes the monthly rainfall throughout the group.

The daily conditions of the weather were telephoned to three daily papers, two evening and one morning, the latter was also furnished with a forecast for the day; this paper also published a weekly meteorological record. All three papers were furnished with a weekly tide-table.

A copy of the monthly summary and rainfall, together with a monthly record of observations, on their own form, was sent to the U. S. Weather Bureau at Washington each month, and published by the Bureau in its official organ, the Monthly Weather Review. As this publication is sent to all the leading observatories, weather offices and scientific societies throughout the world, our reports had a wide circulation. The United States Hydrographic office also received monthly reports from this office. Our published annual report for 1903 was, as has been the custom, sent to the principal observatories and weather offices abroad, and publications received from them in exchange.

The automatic tide-gauge in Honolulu Harbor is under the charge of this office, and has been in continuous service, this being one of the important stations of the world. Duplicates of the records are sent to the Tidal Division of the U. S. Coast and Geodetic Survey twice a year. The mean sea level is also an especial matter of study and the rising and falling of the water in our artesian well subterranean reservoir is noted.

In expectation of the United States Weather Bureau assuming charge of the Weather Service in the Territory, July 1st, 1904, the Territorial Legislature made no appropriation to support the local service after that date. The work of this office will therefore officially cease at that time, but in view of the fact that the United States Bureau is not prepared to take up the work, and that a long series of records may remain unbroken, the Meteorologist will keep up the service as before, in addition to his regular duties in the Survey office proper, until such time as the U. S. Weather Bureau is in position to take it over, which it is expected will be in about two months time, the United States observer being now on the ground and making every effort to establish his office as soon as possible.

In submitting this, the final report of the Territorial Service, a brief summary of the work accomplished seems fitting. From a small beginning, and through the untiring efforts of my predecessor, Prof. C. J. Lyons, this station occupies an important place in the world's climatology. Its records are of no little value, and are carefully studied by meteorologists the world over. Situated as we are near the northern edge of the trade wind belt, it possesses advantages unique in themselves, and opportunities not to be found elsewhere.

Recognizing the importance of the Hawaiian Islands as a meteorological station, and the great benefit the study of its climate would be to the meteorological world, was doubtless what prompted Prof. Lyons to assume the self imposed task of a systematic record and study, and that his efforts have not been in vain is shown by the appreciation with which they have been received. As to the beginning of these observations, Prof. Lyons, then an Assistant in the Government Survey, reported to the Surveyor General, under date of April 24 1890, in part, as follows: "The Government Survey Observations extend back for a period of only seven years for rainfall and about ten for barometer, etc. It may be well in this connection to say that while no especially authorized series of observations has ever been instituted, a beginning has been made in this branch of the public service, viz: the Survey, from a conviction that it was a public duty, and that this Government should to some extent act in unison with all other civilized Governments, in recording and communicating to the world generally the meteorological facts of the country."

This first report was not so much a report of work done, as a gathering up into practical shape of such data as could be obtained from various private records. Mr. Lyons first began keeping temperature and barometer records in 1874, and from that time until 1882, records were kept as circumstances would permit, being interrupted from time to time by absence caused by surveying duties. In 1882 temperature and barometer observations were undertaken in a more systematic manner, to which were added gradually those of wind and weather. In 1883 observations of the above mentioned phenomena, with the addition of the rainfall was begun at the present Weather Bureau Station, and have continued until the present time. In 1890 humidity observations were added to the above and in the same year the out-side stations began their regular rainfall reports, several stations also reporting temperature, which reports are still received.

Other than the reports published in 1890, annual reports of detail have been published embracing 1892-1903. In addition to the reports mentioned a report was published in 1900 of rainfall only, giving the entire monthly rainfall of each station from the beginning of observations, when such beginning was before 1897 and coming down to the close of 1900. In some cases this covers a period of twenty or more years. This report gives the normal average for each month of the year, and the average yearly rainfall for each station. As this report covers the entire group it was doubtless very useful to the agricultural interests of the Territory.

The expense necessary to carry on the work was, to 1895, borne by the Survey Department. The Legislature in that year recognizing the importance of the work, made a regular appropriation for office expenses to which, in 1898, was added a salary appropriation for the Meteorologist, both of which have since been continued.

Considering the limited means and facilities at its command, the office feels a pardonable pride in the record it has made, the results achieved, and the benefits derived for the Islands and the meteorological world generally.

Respectfully submitted,

R. C. LYDECKER,
Territorial Meteorologist.

WALTER E. WALL, ESQ.,
Surveyor, Territory of Hawaii,
Honolulu.

JAN 26 1906

CANCELLED

REPORT

OF THE

SURVEYOR

TO THE

GOVERNOR

OF THE

TERRITORY OF HAWAII

FOR THE

Year Ending June 30, 1905

HONOLULU:
HAWAIIAN STAR PRINT
1905

REPORT

OF THE

SURVEYOR

TO THE

GOVERNOR

OF THE

TERRITORY OF HAWAII

FOR THE

Year Ending June 30, 1905

HONOLULU:
HAWAIIAN STAR PRINT
1905

THE NEW YORK
PUBLIC LIBRARY
CANCELLED

Report of the Surveyor

TO THE

GOVERNOR

OF THE TERRITORY OF HAWAII

FOR THE YEAR ENDING JUNE 30TH, 1905.

TERRITORY OF HAWAII
SURVEY DEPARTMENT

Honolulu, T. H., August 12th, 1905.

Sir:—I have the honor to submit herewith the annual report on the operations of the Survey Department for the twelve months ending the 30th day of June, 1905.

Very respectfully,

WALTER E. WALL,
Surveyor.

To His Excellency, G. R. CARTER,
Governor of the Territory of Hawaii.

ISLAND OF HAWAII.

Puna District.

The only field work done in this district was on the "Olaa New Tract Survey." Mr. E. D. Baldwin, Assistant in Charge of the Hilo and Puna Surveys, has completed all of the field work, four of the five working sheets, and the descriptions of the lots up to number 306. There are 406 lots in this tract, containing over 20,000 acres.

Although this tract was laid out into fifty acre lots some years ago, the work of tying it up to Government Survey Trig. Station "Olaa" was not done until the latter part of 1904.

The former survey of these lots was made by extending the 15¾ mile side-road parallel to the Olaa Reservation lot lines to a selected point, and then turning off a right angle, which line was extended straight through the tract as the center of the Olaa road. The lots and cross roads are all laid out by angles from this line.

All lot corners on both main and cross roads are marked by a two foot galvanized iron pipe, driven nearly flush with the ground.

Similar pipes were set on every lot line, and every lot corner is marked by a post, to which is attached the lot number, stamped on zinc tags by steel dies.

In the former survey, the lots adjoining the Keaau and Waiakea boundary lines could only be approximately located, as it was first necessary to refer by coordinates the initial point to the "Olaa" Trig. Station. Then from these co-ordinates calculate the relation of the lot lines to the above mentioned boundaries; as the Keaau and Waiakea boundary lines had not been marked upon the ground, their position only being known by their coordinate reference to "Olaa" and "Kulani" Trig. Stations.

It was necessary to have this coordinate reference exact, which was no small task, when it is seen that the only way to accomplish it, was by a long traverse of 7½ miles along the Volcano and Olaa roads. The densely wooded condition and plane surface of the country prevents any triangulation methods.

A former accurate steel tape traverse of the Volcano road had been carried as far as the 13 mile post, and the new traverse started from this point.

All of the traverse points were marked, most of them by concrete monuments with a piece of pipe in the center, and the others by a marked stone set in concrete. These marks are permanent and there will be no trouble hereafter to re-run any of the lines.

By this method, all road corners and lot lines are connected, the coordinates computed, and the exact bearings and distances of the actual present location of the lots on the ground were ascertained.

It is interesting to note that in this work, which was done independent of the former survey, the distances along lot lines and cross roads check almost exactly.

Hilo District.

The survey of the Honomu section was made by Mr. A. B. Loebenstein, Special Assistant, in November and December, 1904, and February and March, 1905.

The homestead tract was subdivided into thirty-six lots, averaging about 20.2 acres. It extends from the upper boundary of the leased lands to the 1750 foot contour line, and contains 726.6 acres, exclusive of roads and forest reserves.

Five and three-fifths miles of road, having a maximum grade of 6 per cent. and connecting every lot has been located and staked out.

Along each side of the main gulches running through this tract are forest reserves, one hundred feet in width. There are three such forest reserves, namely: "South side of Kolekole gulch strip," area 33.5 acres; "Kapaheehee gulch strip," area 25.7 acres; and "Kaholono gulch strip," area 30.4 acres. There is another forest reserve, above the homesteads, and extending to the limits of this land, and containing an area of 926 acres. These reserves are intended to protect the water sources to the sugar plantation below.

The mauka portion of the homesteads is quite heavily timbered, but the makai portion, including about 232 acres above the lease line, is planted in cane.

The eight hundred acres of land, leased to the Honomu Sugar Company by the Government, was located.

The map submitted shows the above mentioned details and further details such as topography, original titles, buildings, etc., from the upper limits of the homesteads to the sea shore, and includes the lands of Kuhua, Honomu, Malamalamaiki and Laimi.

Kohala District.

In order to collect further testimony in regard to the dispute as to the boundary of the Ili of Pa-u in the Ahupuaa of Pololu, Assistant S. M. Kanakanui made a flying trip to Hawaii.

The testimony gathered substantiated in every particular the Government's contention of the proper boundary of the Ili of Pa-u.

While there, Mr. Kanakanui set apart three taro lots for homestead leases.

Kona District.

The Superintendent of Forestry of the Board of Commissioners of Agriculture and Forestry, having made arrangements with the lessees of the Government land of Honuaula, to set aside a portion of said land for a forest reserve, this department detailed, in June, 1905, Assistant S. M. Kanakanui to locate and mark the forest reservation lines.

The leased land of Honuaula contains 3044 acres, and extends from a line 3726 feet above and parallel to the upper boundary of this ahupuaa.

The boundary lines of that portion above the homsetead subdivision were first surveyed, being some fifteen miles in length. Then at the request of Forester Hosmer, the forest lines were run and marked.

This proposed forest reserve has an area of 1090 acres, 4.5 acres of which are taken from the Government remainder below the leased land. Below the forest reserve, there is a triangular piece left from the leased land, containing 788.5 acres; above the forest reserve the remainder of the leased land has an area of 1180 acres.

Between the homestead subdivision and the leased land is a large tract, called the Government remainder, with an area of 1605 acres.

The Honuaula homestead subdivision contains an area of 2003.5 acres, and the Kealakehe homestead subdivision, which is however, a part of the ahupuaa of Honuaula, contains an area of 595.6 acres.

On the Puaa side of Honuaula, the forest reserve has a width of 3500 feet; on the Honokohau side, it has a width of 2468 feet and across it has an average length of about 16,885 feet.

This land is covered with a large variety of forest trees, koa, mamani, pukeawe, aaka, pua, kolea, akolea, etc., which were at one time growing very thickly over the entire tract, but have

since been denuded to a large extent, owing to the ravages of cattle. Indeed, it is estimated, that if no attempt is made to preserve the forest, in ten years time this section will be quite bare of trees.

It is excellent grazing land for the greater part of the year. During the very wet months, the cattle are usually driven to the higher levels, where there is no forest and hardly any rain.

Kau District.

In April, 1905, Assistant Geo. F. Wright was detailed to make some surveys in Kau, in connection with lands leased by the Government to the Hawaiian Agricultural Company, better known as the Pahala Plantation.

The division lines between the sugar company's and the Government's lands planted in cane, were run out and marked.

Descriptions and plans were made of the remnants in Mohokea 1 and 2, Moaula, Makaka and Kaalaala to be leased as cane lands.

The total area of these remnants, including cane, pasture, forest, mountain and gulch land, is 1762 acres.

Hilo City and Office Work.

The work on Bridge Street extension into Puueo was unfinished at the end of the last period, June 30, 1904. Much work has been done on it since, in the way of profiles, bench marks, line and grade for road construction and curbing, and the placing of permanent reference points.

Line and grade for road construction, for curbing for buildings, for laying water pipes, were given, and profiles were run for such streets as required them in view of improvements about to be made.

King, Bridge, Front, Waianuenue, Richardson, Ponahawai, Pitman, Volcano, Pleasant and Amauulu are some of the streets on which miscellaneous city work has been done.

Detail surveys and studies, for plans and descriptions or for the use of contractors and builders were made of the sidewalk around the Peacock Block, the Armory Site, the New Jail and Quarry site, Rainbow Falls park reserve, Kainihi park reserve, Hilo Waterhead reserve, etc.

An important work was the setting in cement, to insure their permanency, of the Piopio and Waiakea Bridge Reference Points.

A great deal of the office work was taken up in indexing and putting in reference order the field books and calculations of this office, and in the calculations, map work and descriptions of lots in connection with the Olaa New Tract Survey.

However, much work of a miscellaneous character was also done in the office, some of which was as follows:

Plan of tract between South corner of Front and Ponahawai Streets and Hawaii Mill branch of Hilo Railroad, showing swamps, etc., for the Agent of the Board of Health

Assisted Sub-Agent of the Land Office on records of homesteads in Olaa and Puna.

Adjusted descriptions of Waikaumalo-Maulua homesteads.

Maps of Hilo and Puna districts were compiled for the Hilo Board of Trade, showing homesteads, school houses, government lands, plantations, etc.

A tracing of the new compiled map of Hilo town was also furnished the Hilo Board of Trade.

Data of Puu Kalua hill in re boundary of Kapapala and Keauhou.

Plan and description of block for proposed Federal building.

Reduction of homestead subdivisions to same scale.

Tracing of Hilo town blocks A, B, C, D, E, F and G for the Superintendent of Public Works.

New compiled map of Hilo town. Showing, among other details, the contour lines.

Tracing of the makai section of Olaa roads for the Puna Road Board.

Furnished data in regard to the lands in the unsurveyed section of Puna district.

ISLAND OF MAUI.

No field work has been done on the Island of Maui during the past period, but in March, Assistant S. M. Kanakanui, who is well acquainted with this island, accompanied the Commissioner of Public Lands over it, on an inspection trip, pointing out to him, the location and extent of several Government lands, including Keanae and Wailua in Koolau district; Waiohonu and Wailua in Hana district; Haleakala in Makawao; Omaopio in Kula; Kahakuloa in Kaanapali and remnants in Lahaina.

ISLAND OF MOLOKAI.

Pukoo Landing Survey.

In July, 1904, Assistant S. M. Kanakanui made a survey of two road locations running from the new and the old wharves at Pukoo landing to the main Government road.

A copy of the plan was furnished the Department of Public Works for the use of that office.

United States Leprosy Station Sites.

The last session of Congress having passed an act which provided "That when the Territorial Government of Hawaii shall cede to the United States in perpetuity a suitable tract of land one mile square, more or less, on the Leper Reservation at Molokai, Hawaii, there shall be established thereon a hospital station and laboratory of the Public Health and Marine Hospital Service of the United States, for the study of the methods of transmission, cause and treatment of Leprosy," this department was directed by the Governor, in the early part of June, to detail a party to make the necessary surveys in order to carry out the provisions of the act.

Surgeon-General Walter Wyman, Chief of the United States Public Health and Marine Hospital Service having selected the pieces of land which would be required by the Federal Government, the surveys were made and the boundaries substantially marked out on the ground.

Descriptions of the different pieces and maps showing all details of the survey were made and furnished, and these lots were ceded to the United States Government by proclamation of the Governor of the Territory of Hawaii, dated June 28, 1905.

The lots consist of four pieces to be used for different purposes, as follows:

A. Landing Site. Situated on the East side of Waikolu Stream, on the sea shore. Area 18.9 acres.

B. Spring Site. Situated on the East side of Waikolu Stream, on side of hill. Area 4.5 acres.

C. Hospital Site. Situated in Kalawao; East of the Baldwin Home premises and running from the sea shore some 2000 feet back into Waialeia Valley. Area 114.0 acres.

D. Reservation Site. Situated in Kalawao and Makanalua and running from the sea shore nearly to the road from Kalaupapa Landing, back of and including Kauhako Crater. Area 502.6 acres.

ISLAND OF KAUAI.

Since the close of the last period a great deal of work has been done on the Island of Kauai; being a continuation of the work commenced in the spring of 1904, and also new work.

The land of Puupehu, formerly a Crown land, in Hanalei, Halelea district, was surveyed and divided into two lots, of 879 and 984 acres each and was finally sold at auction.

This land is almost entirely covered with lantana and guava, which grow several feet in height, making an impenetrable thicket, and thereby lessening the value of it materially. Otherwise it would make good grazing land.

A portion of this land, called Anini and situated on the sea shore was reserved. There are several kuleanas within Anini, which were all located. The balance is Government land.

An application having been made for a lot therein, the department prepared and furnished the Land Office with a plan and description of said lot, which contains 1.73 acres.

A preliminary survey of the Government land in Waioli, on the sea shore, was made, with the object of opening up beach lots. This plan was abandoned, however, and no further work was done.

In Hanalei, Halelea district, a portion of the Government land has been subdivided into homesteads, consisting of dry and wet land. There are twenty-two lots of wet land and sixteen lots of dry land; the kula or dry land lots averaging 4½ acres and the taro or wet land lots 1 acre. These lots are situated on the Hanalei River, about 2½ miles from the landing. The detail map, descriptions and plans have all been completed.

These lots have all been taken up on homestead leases and there are many applications in for a further subdivision of the balance of the Government land in that section.

A very important work done at this time was the running of the Halelea-Koolau forest reserve line, from the ridge dividing the districts of Halelea and Na Pali across the lands of Wainiha, Lumahai, Waipa, Waioli, Hanalei, just above the Southern boundary of Kalihikai, and through Kalihiwai, all in the district of Halelea; across the lands of Kilauea, Kahili and Pilaa in the district of Koolau, to a hill on the makai side of the Ka Loko reservoir, in all a distance of 12½ miles.

The proposed forest reserve in the Government land of Hanalei, alone, extends from the above line passing through this land, along the boundary of Kalihiwai and Kalihikai, thence to the main range of mountains across the island, the Koolau

range, to the prominent peak of Waialeale, thence down the ridge, being the boundary of Wainiha, Lumahai and Waioli, to the forest reserve line; and contains an approximate area of 11,340 acres. Within this great tract, approximately 3,000 acres of the bottom lands of Hanalei Valley are reserved for agricultural purposes.

The land in Waioli, also a Government land, proposed to be reserved for forest purposes, extends from the forest reserve line, to the upper limits of this ahupuaa, and contains 2650 acres.

A major portion of the forest reserve is covered with thick vegetation; higher up, it becomes so dense as to be impassible, even for cattle. Koa trees of great size grow on the hill-sides, and all kinds of tropical ferns, vines, palms and trees grow luxuriantly.

In regard to the forest reserves within the other lands, nothing has been definitely decided.

During this survey, the Assistant also made a study of the Hanalei Valley watershed.

On this survey, in these two districts, a few of the old triangulation stations were recovered and a great many new ones established. Owing to the necessity for the completion of the work in a short time, but a few of the stations were permanently marked.

The following is a list of the stations, which have substantial and permanent marks, most of them being on the forest reserve line:

"Kilauea" Marked by an iron pipe and ahu. In Kilauea, Koolau district. Old station recovered.

"Puu Pane" marked by an iron pipe. At the head of West Waiakalua, in Koolau district.

"Ka Loko" marked by an iron pipe. Makai of Ka Loko reservoir, in Pilaa, Koolau district.

"Kokoiki" marked by a galvanized pipe, 1 inch in diameter. On the boundary of Anahola, Kilauea and Kalihiwai.

"Pueo" marked by an iron pipe. On the boundary of Anahola, Kealia and Kalihiwai.

"Pooku" marked by a brick pier. In Hanalai, Halelea district. Old station recovered. E. D. Preston's old magnetic station.

"Kapaka" marked by a cross on stone and ahu. On boundary of Kalihikai, Kalihiwai and Hanalei.

"Waihunahuna" marked by a granite post. In Kalihiwai, Halelea district.

"Waihaa" marked by a concrete post. In Kalihiwai.
"Kamookoa" marked by an iron pipe. In Kalihiwai.
"Paina" marked by an iron grate bar. In Hanalei Valley. The lots of the Hanalei homesteads are tied to this station.
"Waikiko" marked by an iron grate bar. In Hanalei.
"Puuonioni" marked by a cross on large flat rock. In Hanalei.
"Hanalei" marked by a cross on stone. On boundary of Wailua, Hanalei and Kalihiwai.

All the above work was done during the months of July and August, 1904.

The leases on the lands of Anahola and Kamalomalo, the former in Koolau district and the latter in Puna district, are to expire in the early part of 1907, so a survey of them was required in order to facilitate further action in regard to their disposal. The work on this survey was commenced in November, and finished by the end of December.

In Anahola, there are about a hundred kuleanas, which were all located and marked. There are no kuleanas in Kamalomalo, which was formerly a Crown land.

The survey of these two lands was taken up at the same time. The boundaries were run; cane and wet land located, and the areas calculated; a general topographic and detail survey was made, including mountains, marshes, rivers, streams, reservoirs, roads, wharves, buildings, etc.

In addition, a forest reserve line was run, a continuation of the Halelea-Koolau forest reserve line, in conformity with the general scheme of forest reserves on the Island of Kauai.

The line starts from a point on the boundary of Anahola and Aliomanu, that portion between Ka Loko, which is the end of the Halelea-Koolau forest reserve line, and the above point, not having been run. This line runs across Anahola and Kamalomalo to Puu Kinui, a prominent hill in the land of Kealia, and has a length of six miles. The forest reserve extends from this line up to the same main range mentioned above, the Koolau range. The area has not been calculated.

In the course of this survey, the following triangulation stations were established and substantially marked:

"Puu Eu" marked by a cross on stone on the peak of this name. On boundary of Aliomanu and Anahola.
"Kikoo" marked by a cross on stone and large ahu on the peak of this name. On the boundary of Aliomanu and Anahola.

"North Base" marked by a cross on stone near the edge of bluff.

"Kahala" marked by a cross on stone near Lae Kahala near the sea shore.

"Pohakuloa" marked by a cross on large stone, near edge of long flume, in field 16.

"Paepae" marked by a cross on stone, on forest reserve line, In Anahola.

"Panikioi" marked by a cross on stone on forest reserve line. In Anahola.

"Kiokala" marked by a cross on stone on forest reserve line. In Anahola.

"Kamana" marked by a galvanized iron pipe, with a large rock just East of it. On the boundary of Anahola, Kamalomalo and forest reserve.

"Keapua" marked by a triangle on a large flat rock, about 75 feet South of the road running mauka. In Kealia.

Kapaa, in the district of Puna, being in the same condition as Anahola and Kamalomalo, was also required to be surveyed. This was done during the months of April, May and June, 1905.

A complete and elaborate detail and topographic survey was made of this land; including the running and marking of the boundaries, and as Kealia is the only land between Kapaa and Kamalomalo, one might say that the boundaries of Kealia were also marked; the location of cane fields, rice fields, grazing land, waste and mountain land, marshes, reservoirs, ditches, streams, gulches, hills, peaks, ridges, watersheds, sea shore, landings, wharves, mills, buildings, as well as the location of original titles, such as grants and kuleanas. A similar survey of the South or Government part of Olohena was also made. The mapping of these two valuable lands will be taken up at once, so that a better knowledge of their worth may be had.

The proposed forest reserve line was continued from Puu Kinui through Kealia, Kapaa, Waipouli, Olohena, to the peak of Hanahanapuni in Wailua, a distance of seven miles.

The admirable system of triangulation commenced in the Hanalei surveys was continued on this survey, with more attention paid to the marking of the stations.

All of the stations occupied were permanently marked. Following are a few of the most important stations in this section:

"Kalepa" marked by a redwood post and ahu. In Hanamaula. Old station recovered.

"Nonou" marked by an iron pipe and ahu. In Wailua on Nonou peak. Old station recovered.

"Pehuaola" marked by a galvanized iron pipe. At the head of Olohena and on the boundary of Kapaa and Wailua.

"Pohakupili" marked by a cross on a rock in situ and large ahu. Prominent and well known point on the boundary of Kapaa and Kealia.

"Kulamanu" marked by a galvanized iron pipe on the boundary of Kealia and Kapaa.

"Lae" marked by a galvanized iron pipe. In Kapaa, South of the bridge across Kealia river.

"Wailea" marked by a galvanized iron pipe. On the boundary of Kealia and Kapaa, a few feet North of bridge and East of Government road.

"North Base" marked by a galvanized iron pipe. About 250 feet Southeast of old Kapaa Mill chimney.

"South Base" marked by a galvanized iron pipe in Kapaa, a few feet East of Government road and South of native church.

"Keaka" marked by a galvanized iron pipe surrounded by three stones. Just East of Government road and on the boundary of Kapaa and Waipouli.

"Kaluakalepo" marked by a galvanized iron pipe and along large flat rock set on edge and to the West of it. On beach at the initial point of Kapaa and Waipouli.

"Makahaikupanihi" marked by a cross on square stone on the boundary of Waipouli and Kapaa, near an old fish pond.

"Haleilio" marked by a cross on large rock, which looks from below like a dog-house. On the boundary of Olohena and Wailua.

"Kaiwa" marked by a cross on stone, on a hill of this name. In Olohena.

"Kainahola" marked by a galvanized iron pipe, at the head of a small spur just North of Kainahola Falls. On the boundary of Kapaa and Waipouli.

"Mailihuna" marked by a cross on a stone, about 2000 feet East of the Government road. In Kapaa.

"Hanahanapuni" marked by a galvanized iron pipe on the East side of this crater. In Wailua.

"Puupilu" marked by a galvanized iron pipe on a well known hill of same name. In Wailua.

"Kainamanu" marked by a galvanized iron pipe on the boundary of Waipouli and Kapaa.

"Pohakiikii" marked by a galvanized iron pipe, on a narrow ridge in Moalepe gulch, on forest reserve line and in the land of Kapaa.

The entire survey work on the Island of Kauai, herewith reported, was done by Assistant Fred E. Harvey, with the exception of the location of the cane fields in Anahola and Kamalomalo, which was done by Assistant Geo. F. Wright.

In the location of the boundaries of the different lands, Mr. Harvey was very careful to recover and identity the ancient marks and points and would not accept any point until convinced that such was intended in the description of survey. Also, in the location of kuleanas and grants, no point was marked, without being well established by the best kamaaina evidence obtainable.

The running of the forest reserve lines and the occupation of triangulation stations, was rough, hard, mountainous work, but was performed quickly, conscientiously and satisfactorily.

ISLAND OF OAHU.

The subdivision of the Pupukea-Paumalu Homesteads, unfinished work from last period, was finally completed by November 20, 1904; it being necessary to re-subdivide it, on account of changes in the lot areas, etc., required by the Commissioner of Public Lands.

The areas of the lots were computed, and a tracing and blue prints were furnished the Land Office for the use of prospective homesteaders.

There are twenty lots in the new subdivision, averaging one hundred forty acres; three water reserves of 67.5 acres, a Government remnant of 56 acres, a school lot reserve of 2 acres, a forest reserve of 1509 acres, and the entire strip between the sea and the Oahu Railway & Land Company's right-of-way is reserved, containing about 165 acres. These lots, reserves, etc., are all staked out and marked, besides which about five miles of road are located and staked out.

The lots are situated on the line of the Oahu Railway & Land Co., eight miles Northeast of Haleiwa Hotel, Waialua, and near the Waialee Industrial School. They have since been opened for settlement, and are nearly all taken up.

The topography, subdivision and marking of lots and reserves, road location, map work, and calculation of areas were made by Assistant Geo. F. Wright, and is a creditable piece of work.

Early in January, 1905, Assistant Geo. F. Wright commenced the survey of upper Palolo Valley, running boundary lines of Government and private lands, and making a general topographic survey of the valley.

On completion of the map, plans were made for a subdivision of the Government lands; and the Palolo Homesteads were then staked out and marked; there being two sections known as the Pukele-Waiomao or Mauka subdivision, and the Pukele or Makai subdivision.

The former is situated at the upper limits of the valley, there being however, between the boundary of the homestead lots in Waiomao and the main Koolau range, a proposed forest reserve called the Waiomao Forest Reserve; in Pukele to the Northeast of the homestead lots is another called the Pukele Forest Reserve.

The mauka subdivision consists of twenty lots, ranging in area from 2.17 acres to 31.30 acres; this comprises mountainous and arable lands together; the arable land averages about six acres to each lot. All these lots have been taken as homesteads by "Right of Purchase Leases" under the Land Act.

There are also six lots in this subdivision designed especially for Hawaiian tenants. They are designated A, B, C, D, E and F, and embrace both taro and kula land in each lot. They are small lots, the largest no more than four acres in extent.

The Pukele or Makai subdivision is in the lower part of the valley; is only one-fourth of a mile from the Waialae Road, on which is the electric car line, and makes desirable house lots.

There are twenty lots averaging $1\frac{3}{4}$ acres; none being less than $1\frac{1}{4}$ acres nor more than 2 1-5 acres.

Some triangulation was done to establish stations in the upper portion of Nuuanu Valley. This was for the use of the engineer employed by the Department of Public Works, to make a study of the valley in regard to its value as a watershed.

The school lot at Kaaawa, Koolaupoko, and a lot nearby owned by Mrs. Swanzy, were surveyed and staked out.

The present school lot near Haleiwa Hotel, Waialua, and the proposed new lot at Paalaa, belonging to the Bishop Estate, were also surveyed.

Plans and descriptions of these four pieces were made and furnished the Department of Public Instruction, to aid it in making exchanges for new school sites.

A portion of the Government land of Kanohuluiwi, in Kaneohe, Koolaupoko, was surveyed and staked out; and a plan and description made and furnished the Department of Public Works, to aid that office in the consummation of an exchange agreement.

During the past year several surveys and plans were made for the Attorney-General's Department in cases where murders or other crimes were committed, and in which plans were needed to show clearly the scene of the crime.

Kahauiki, on the road to Moanalua. Damon murder case.
Territory of Hawaii vs. Jose Miranda.

Pantheon Saloon premises, Honolulu. Harris murder case.
Territory of Hawaii vs. Geneaux.

Portion laborers' camp; Waialua plantation. Japanese killed.
Territory of Hawaii vs. Kawasaki.

Portion of laborers' camp; Waimanalo plantation. Japanese killed.
Territory of Hawaii vs. Fugita.

Residence of Mrs. Jones, Kinau Street, Honolulu.
Territory of Hawaii vs. E. M. Jones.

Residence of Naone family, Kawaiahao Street, Honolulu.
Territory of Hawaii vs. Phillip Naone.

Premises situated on River Street, corner of Pauahi Street, Honolulu.
Territory of Hawaii vs. Kansora Tanda.

Portion of laborers' camp; Kahuku plantation.
Territory of Hawaii vs. Takada.

HONOLULU CITY WORK.

The following gives an idea of the nature and amount of work done by the engineering branch of the department, under the direction of Assistant O. L. Sorenson, during the past year:
Lines marked on the ground for street widenings and extensions:

Fort Street widening..... 825 feet.
Halekauwila Street extension.....1250
Houghtailing Road widening and opening.....4500

	Feet
Iwilei Road widening	700
King Street widening—Palama Section	750
King Street widening—Kahauiki Section	
Kalihi-waena Street widening	900
Metcalf Street widening	4400
Nuuanu Avenue widening	200
Oahu Avenue extension	1600
Queen Street widening	1500
School Street extension—Palama Section	4000
School Street extension—Kalihi Section	2630
Smith Street extension	1000

Street lines and grades for fencing, road construction, etc.:

Anapuni Street	800 feet
Bingham Street	400
College Street	800
Dominis Street	300
Diamond Head Road	100
Fort Street extension	10000
Hotel Street	3000
Halekauwila Street	700
Halekauwila Street extension	1000
Houghtailing Road	2800
Judd Street	3600
Kukui Street extension	4245
Kawaiahao Street	2400
King Street	200
Liliha Street	750
Mililani Street	860
Miller Street	600
Oahu Avenue extension	4950
Punchbowl Street—Upper section	1200
Punchbowl Street—Lower section	2100
Queen Street—Kewalo section	4600
Queen Street extension—Iwilei section	950
School Street	3000
School Street extension	23550
South Street	1370
Thurston Avenue	150
Victoria Street	1100
Young Street	2000

Lines and grades given for curbing:

Anapuni Street	800 feet.
Beretania Avenue	225
College Street	1945
Dominis Street	300
Emma Square	1500
Fort Street	1075
Fort Street extension	6520
Green Street	500
Green and Ernest Streets	500
Hotel Street	3510
Hastings Street	500
Halekauwila Street	1650
Kinau Street	500
Keeaumoku Street	250
Kapiolani Street	1200
Kukui Street extension	1400
Kalihi-waena Street	450
Kilauea Street	90
Lunalilo Street	400
Miller Street	200
Mililani Street	860
Matlock Street	800
Nuuanu Avenue	161
Punchbowl Street	1410
Queen Street	200
River Street	150
School Street extension	7820
Thurston Avenue	75
Victoria Street	400
Wilder Avenue	3500
Young Street	800

Grades run and profiles made:

Atherton Road (two routes)	5000 feet.
Coral Street	1600
Fort street extension	1300
Green Street	550
Houghtailing Road	2250
Kawaiahao Street	800
Kawaiahao Drain	300
Kalihi Reservoir	1500
Lantana Road—Kaala Ave. to Beretania Ave.	4700

Magazine Street 900
Metcalf Street extension..... 1400
Pua Lane Drain—Palama section 388
Queen Street extension..... 475
South Street 1850
School Street extension—
Asylum Road to Houghtailing Road..... 2400
School Street extension—
Houghtailing Road to Kalihi Road..... 1900
School Street extension—
Kalihi Road to Kamehameha IV Road..... 2630

Cross sections for estimates of material and expense of construction:
Kukui Etreet Extension.
Lantana Road ..... 3600 feet.
Metcalf Street 3200
Queen Street extension..... 475
School Street extension—Liliha Street—West.. 4300
School Street extension—Kalihi section..... 3200

Lines for H. R. T. & L. Co., Electric Light and Telephone, Poles:
Beretania Avenue—Kamoiliili section..... 4000 feet.
Edingburgh Street 350
King Street—Kalihi Section..... 600
Nuuanu Avenue 600

Line for H. R. T. & L. Co. for laying track:
King Street—Kahauiki section..... 3880 feet.

Lines for laying water pipes:
Beretania Avenue—Kamoiliili section..... 6350 feet.
Puunui Avenue 2500
Wyllie Street 900
Metcalf Street 2000

Line and grade for buildings:
Hotel and Punchbowl Streets.
Smith Street.
King Street.
Queen Street extension—Building excavations.
King Street—opposite Iwilei Road.
New Quarantine Station—Kakaako.

Richards Street.
Queen Street.
King Street.
Liliha Street.

Line and grade for catch-basins for storm sewers:
Spencer and Victoria Streets.

Line and grade for bridge sites:
Fort and Kuakini Streets extensions.
School Street extension—Culvert near Houghtailing Road.
School Street extension—Location and elevations.
Houghtailing Road.

Miscellaneous surveys:

Iwilei Road widening	Location.
School Street extension—Asylum Road—West	"
School Street extension—Kalihi Rd. to Kam. IV Rd.	"
Metcalf Street	"
Houghtailing Road	"
Smith Street extension	"
Lantana Road—Kaala Ave. to Beretania Ave.	"
New Tantalus Road to Lot 7A	"
Judd Street—Nuuanu Ave. to Liliha St.	"
Peterson Lane, Kapalama	Location sketch.
Government remnant, Diamond H. Rd.	Survey for description
Moiliili Quarry Site	" "
Punchbowl Slope Lots	" "
Cunha Lot on Maunakea Street	" "
Title Survey, Kaiulani St., Waikiki	" "
Title Survey, portion of Iwilei; Oahu prison and vicinity.	
Nuuanu Valley Govt. Lots Nos. 2 and 3	Staked Out.
Pauoa Quarry	" "
Government remnant, School Street ext.	" "
Esplanade Lots Nos. 26 and 27	" "
Fire Limits on King Street	" "
Normal School Building Site	" "
Sewer Pumping Station Lot, Kakaako	" "
Government remnant, Smith Street extension	" "
Kalihi Reservoir fence line	" "

Marking 200, 300, 400, 500, 600, and 1000 yard shooting ranges at Kahauiki for the National Guard of Hawaii.
Duck Pond at Waikiki. Grades given for filling to accord with Board of Health regulation.
Grade and line for sewer, 4th. District Stables, Kakaako.
Contour survey. Kalihi Stream and School Street extension bridge site.

Measuring 5½ miles along H. R. T. & L. Co. track for Attorney-General's department.
Azimuths for the Weather Bureau.
Elevation of streets in Kakaako.
Head of Manoa Valley. Survey and plan of new road.
Location of kuleana on corner of King Street and lane near Kalihi Pumping Station.
Checking bench marks on Kamehameha IV Road and School Street extension.
Location for Board of Health of road running from Beretania Avenue up past Moiliili Quarry to Japanese Camp.

HONOLULU OFFICE WORK.

All surveys made in the field are always mapped in the office, the important ones are registered and filed for reference.

Following is a list of the maps, plans, tracings and charts registered during the past twelve months:

Maps made in the office:

	Scale.
Hanalei, Halelea, Kauai	1:6000
Hanalei Homesteads, Halelea, Kauai	1:1200
Halelea-Koolau Forest Reserve Line, Kauai	1:24000
Anahola and Kamalomalo, Koolau and Puna, Kauai	1:6000
Anahola Valley Details, Koolau, Kauai	1:2400
Beretania Ave. and Makiki St.—East, Honolulu	1:600
Kaiulani Street and Vicinity, Waikiki, Oahu	1:240
Palolo Homesteads, Palolo Valley, Oahu—Pukele or Makai subdivision	1:1200
Palolo Homesteads, Palolo Valley, Oahu—Pukele-Waiomao or Mauka subdivision	1:2400
Honomu Homesteads, Hilo, Hawaii	1:6000
Opihihali Homesteads and Govt. Remainder, South Kona, Hawaii. (Unfinished)	1:12000
U. S. Leprosy Station Sites, Waikolu and Kalawao, Molokai	1:2400
Olaa New Tract (in five sections).	

Plans made in the office:

Iwilei Road Widening—Oahu Jail Premises, Hon	1:240
Kalihi Stream and School Street Crossing, Hon	1:240
School Street Extension, Kalihi Road to Kamehameha IV Road	1:1200
Chamberlain and South Streets—North, Honolulu	1:240

Scale.

Chamberlain and South Streets, Honolulu.....1:600
Manoa Lots, Manoa Valley, Oahu.....1:600
Kalaepohaku Cemetery, Kalihi, Oahu.....1:600
Kaiulani School Premises, King Street, Honolulu..1:360
King Street Widening, Kalihi, Oahu.....1:600
Liliha and School Streets—North, Honolulu.....1:240
Government land in Hamamakawaha, Manoa Valley
Oahu.....1:240
Waioli, Kauai. Preliminary survey along beach...1:1200
Kalihi Quarry Site, Kalihi Valley, Oahu.....1:600
Kaaawa School Lot, Koolaupoko, Oahu.....1:600
Judd Street Widening, Honolulu.....1:600
Houghtailing Road Widening, Kapalama, Honolulu.1:600
Kanohuluiwi Government Remnant, Kaneohe, Oahu.1:600
Kapahulu Road, Honolulu.....1:600
Monsarrat Road, Honolulu.....1:600
Gulick Avenue and Vicinity, Kalihi, Oahu,
Copy of M. D. Monsarrat's map.....1:600
Waialua School Lot, Waialua, Oahu.....1:600
Portion of New Manoa Road, Manoa Valley, Oahu..1:240

Tracings made for filing in office:
Opihikao, Puna, Hawaii,
Copy of Public Lands Map No. 16.....1:600
Laupahoehoe Homesteads, Hilo, Hawaii.....1:6000
Puna, Hawaii. Nanawale to Keaau.....1:6000
Kulaokahua Section, Honolulu,
Showing position of street monuments.....1:1200
Hilo Town Lots. Blocks A, B, C, and D, Hilo,
Hawaii.....1:600

Tracings made from maps of private surveyors for filing in office:
Honokaa Plantation, Hamakua, Hawaii.....1:3600
Courtesy of C. V. E. Dove, Esq.
Ahuimanu. Catholic Mission Property. Koolaupoko,
Oahu.....1:2400
Courtesy of C. V. E. Dove, Esq.
Pacific Mill Plantation, Kukuihaele, Hamakua,
Hawaii.....1:3600
Map by A.J. Williamson, Esq.
Courtesy of C. V. E. Dove, Esq.
Niulii Plantation, North Kohala, Hawaii.....1:3600
Courtesy of A. B. Loebenstein, Esq.

Scale.

Makapala, North Kohala, Hawaii.....1:3600
Courtesy of A. B. Loebenstein, Esq.
Kalihi-kai, Wilcox Estate Land, Oahu.....1:1200
Courtesy of A. C. Alexander, Esq.
Paauau, Kau, Hawaii.....1 in. equals 32 ch.
Courtesy of Trustees of B. P. Bishop Estate.
Grant 4582 to Liliuokalani, Hamamakawaha, Manoa, Oahu.....1:240
Courtesy of S. M. Kanakanui, Esq.

Charts filed in the office:
Hanapepe Bay, Kauai.....1:5000
U. S. Coast and Geodetic Survey Chart.

Blue prints made from tracings of private surveyors for filing in office:
Olaa Sugar Co., Ltd. Sugar Lands, Olaa, Puna, Hawaii.....1:24000
Courtesy of S. G. Walker, Esq.
Lumahai, Kauai. Old map of Jas. W. Gay. 1 in. equals 20 ch.
Courtesy of Trustees of B. P. Bishop Estate.

Number of maps, tracings, blue prints and charts registered and filed..... 56 Total 2309
Number of descriptions of surveys furnished, including homestead surveys.....183
Number of field books registered and filed..... 32
Number of tracings furnished (not including tracings and sketch plans attached to descriptions of surveys).....120
Number of tracings attached to descriptions of surveys, including duplicates.....366
Number of blue prints furnished.....1000
Number of reports and official letters, received..363
Number of reports and official letters, written....371

Plans and descriptions for homestead lots, for pieces required for street widenings or extensions, Government pieces or tracts of land for lease, for sale or for exchange, for park reserve or forest reserves or anything connected with the public service are made and furnished whenever required.

Miscellaneous office work deserving special mention:

This department had furnished the Tax Office, in 1902, city block tracings of Honolulu, giving frontages, areas and the

names of the owners. In addition to this the Tax Assessor wished to have the original title lines placed on the plans and as most of the tracings had been more or less defaced, it was necessary to make duplicates or blue prints. Over seventy-five blue prints were furnished the Tax Office.

Although Assistant S. M. Kanakanui has done some field and office work for this department, most of his time in the past year has been spent in assisting the Attorney-General in the title studies of the different claims for fisheries submitted to the Government. Many claims have passed through his hands, each one of which was given a thorough and careful study and a report made thereon to the Attorney-General.

A plan subdividing a portion of the Crown land of Auwaiolimu in Honolulu, and descriptions of the lots were furnished the Superintendent of Public Works, the matter being under his jurisdiction. It is a Crown lease to J. H. Brown, which is about to expire, and the sub-lessees wish to acquire the land from the Government. The land fronts on Luso Street, adjoining the Queen's Hospital premises, and contains about 3.08 acres. It it subdivided into thirteen lots, averaging 6400 square feet, with a piece of 17,000 square feet reserved.

L. E. Pinkham, Esq., having been appointed chairman of a committee to make a report on the Territory of Hawaii, its industries, agriculture, labor, etc., requested the services of this department in the preparation of certain maps and data.

Maps of the islands were furnished him, showing approximately the area comprised by homesteads, sugar plantations, agricultural land, wet land and land capable of agriculture with and without inexpensive and expensive irrigation. The areas of these different lands, and also of waste, forest and mountain lands were furnished him along with the maps.

Cross section plans were also compiled for him, of the Islands of Hawaii, Maui, Oahu, and Kauai, showing elevations from North to South and from East to West.

Maps of some of the more important sugar plantations on the Island of Hawaii, were also compiled in this manner.

Five blue prints of each and every tracing and description filed in the Court of Land Registration are made in the office.

All descriptions filed with petitions in the Court of Land Registration, wherein the title or bounds of Government lands; or public highways or any other public right, may be affected, are checked and a report made thereon to the Attorney-Geueral.

Plans and descriptions were compiled for forest reserves in Kaipapau Valley, Oahu, containing 913 acres; in Hamakua district, Hawaii, including the lands of Honopue, Waikapu, Apua, Nakooka, Waimanu and Muliwai, with an approximate area of 18,940 acres, and excluding Laupahoehoe, Waimanu Homesteads, and the kuleanas in Waimanu; in Kona district, Hawaii, the Honuaula forest reserve.

Some assistance was given the Forester in revising the maps and description of the Hilo forest reserve. This large reserve was found to contain approximately 110,000 acres.

The Koolau forest reserve lines, Maui, have been drawn on the map of Maui, in compliance with a request of the Forestry Division, and the area has been computed, being 42,969 acres.

The U. S. Weather Bureau took charge of the meteorological office on September 1, 1904; there being no longer a Territorial Weather Bureau from that date. All data, records, and information pertaining to the meteorology of the islands were turned over to the Section Director at the same time.

The observations for standard time and the direction of the standard tide-gauge in Honolulu harbor are still under the superintendence of this department, however.

The S. S. "Patterson," of the U. S. Coast and Geodetic Survey, came here in the winter of 1904 to make certain hydrographic surveys about the Islands of Lanai and Kahoolawe, and the Maui channel. Information as to the triangulation stations in that section, coast lines, etc., were furnished to the party.

Very often maps and descriptions of surveys, made by private surveyors, are sent to the other departments, such as the Land, Public Works or Forestry, accompanying applications for leasing, buying, etc. These are usually checked by this department before final action is taken.

A question of the titles and boundaries of certain lands having been raised, this department made studies of them and reported thereon. The lands were: the Ili of Waiau, Hilo, Hawaii; the Ahupuaas of Waikapu and Ukumehame, Wailuku, Maui; and the Ili of Ohia, Makawao, Maui.

The area of that section of Honolulu covered by the letter-carrier service containing 3.79 square miles was computed from the records of this office and furnished the Postmaster of Honolulu upon his request.

Tracings of Honolulu, Hilo and Kahului, and maps of Oahu and Maui, showing the limits of certain classes of liquor licenses, were furnished the Treasury Department.

The old worn-out map of Kalihi Valley—Middle Section, was duplicated.

UNFINISHED WORK.

It might be said that there is less than the usual amount of unfinished work in hand.

The maps have been kept pretty well up to date, and there remains but little plotting to show all of the recent transactions or grants, deeds, etc.

The important unfinished work is as follows:

Group map of the islands now under compilation. Scale 1:480000.

Working sheets 4 and 5 of the "Olaa New Tract" homestead lots.

Descriptions of surveys of 100 of the "Olaa New Tract" homestead lots.

Map of the land of Kapaa, Kauai.

Map of the Government portion of Olohena, Kauai.

It having been decided to increase the areas of the Honomu homestead lots, the descriptions of surveys are being altered, thereby giving an average acreage of 31.14 acres to the lot. Lot 29 of the first subdivision has been reserved, and about 1⅓ miles of unnecessary roadway has been thrown into the lots This reduces the number of lots from 36 to 22. Points already marked are used for the new lot corners, and all the work necessary to conform to the amended subdivision is the running of one or two lines and the re-numbering of the lots.

NEW WORK.

The new work of the coming period will differ to some extent from that of the past.

Now that the County of Oahu must take over much of the city engineering work that was formerly done by this office, it will leave the department more free to take up the important matter of systematically surveying and mapping the public lands, and subdividing such as may be available and desirable for homestead purposes.

The order in which this work will be taken up will depend on the necessity of the surveys.

Re-surveys of many of the lands will be necessary in order to obtain good and reliable information for future transactions, owing to the changed conditions brought about through agricultural and other developments since they were leased many years ago.

It is also very important that the boundaries of all public lands should be established and substantially marked as rapidly as possible, for the kamaainas, who are able to assist in the matter, are rapidly passing away.

In all of the new surveys, special attention has been given to the placing of lasting monuments at important points along the boundaries of public lands.

Such results as have been obtained, will be of value at any time, no matter what action may be taken in the disposal of these public lands.

The statement of receipts and expenditures of the department for the year, follow.

Expenditures and Receipts of the Survey Department,
For the twelve months ending June 30, 1905.

EXPENDITURES.

Salary of Surveyor	$ 2,700.00
Salary of Chief Assistant	2,220.00
Salary of First Assistant	1,980.00
Salary of Second Assistant	1,740.00
Salary of Messenger	480.00
Expenses of Field Parties and Office Work	11,093.46
	$20,213.46

RECEIPTS.

Sales of Published Maps	$ 161.50
Sales of Blue Prints	84.95
Sales of Tracings	74.00
Time Signal Service	15.00
Data furnished	23.85
Professional Services	172.00
	$ 531.30

REPORT

OF THE

SURVEYOR

TO THE

GOVERNOR

OF THE

TERRITORY OF HAWAII

FOR THE

Eighteen Months Ending December 31, 1906

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REPORT

OF THE

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1907

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TILDEN FOUNDATIONS
1907

REPORT OF THE SURVEYOR

TO THE

GOVERNOR

OF THE TERRITORY OF HAWAII

FOR THE EIGHTEEN MONTHS ENDING DECEMBER 31, 1906

SURVEY DEPARTMENT

Honolulu, T. H., Jan. 7th, 1907.

Sir: In compliance with your request of the 6th ultimo, I have the honor to submit herewith the report of the operations of the Survey Department for the eighteen months ending the 31st day of December, 1906.

Very respectfully,

WALTER E. WALL,
Surveyor.

To His Excellency, G. R. CARTER,
Governor of the Territory of Hawaii.

FIELD WORK

ISLAND OF HAWAII.

PUNA DISTRICT.

Several school lots were surveyed in this district during the past eighteen months, and plans and descriptions made of each.

Kapoho School Lot. Area 0.60 of an acre. Surveyed in December, 1905, buildings and fences located and corners permanently marked. Later a description was compiled at the request of the Superintendent of Pubilc Instruction increasing the area of this lot to 1.0 acre.

Olaa Homestead Reservation School Lot. This lot was resurveyed and the boundaries marked in April, 1906. Area 4.87 acres.

In the latter part of May, 1906, our assistant surveyed and investigated the titles and locations of the following school lots:

Keekee School Lot. The location of the original Keekee school grant is in a very undesirable locality, being situated away from the road and in a wild jungle of guava. The present school lot containing 0.25 of an acre is situated on private land. In view of these facts, the assistant recommended a new site opposite the present lot, between the road and the sea. This new lot contains 0.86 of an acre, is situated on government land and is in every way an improvement on the former site.

Kauaea School Lot. This lot, containing 1.0 acre, is situated in the land of Kauaea, belonging to the Bishop Estate and fronts on the government road. All corners were permanently marked at the time of the survey.

Kapoho School Grant. This is not the same Kapoho school lot referred to above, but the original school grant which was situated near the sea shore and is now under water, as quite a portion of this sea coast sank in the year 1868.

Puula School Grant. The Puula school grant was never used for school purposes, a church occupying a portion of it, however, for many years. This lot, together with the land surrounding it, was granted by the government a few years ago, and in view of the fact that the Department of Public Instruction does not desire

it for school purposes our assistant recommends that nothing be done in the matter.

Pahoa Village Lots. These lots were laid out in April, 1902, and many of the marks having been destroyed since then, our assistant while in Puna re-staked the lots. The corners were identified and marked by spikes and piles of stones; stakes with the lot numbers were also placed at each corner. There are 25 lots in the subdivision with an average frontage of 50 feet on the Hilo-Puna government road, and a depth of 200 feet.

HILO DISTRICT.

Honomu Homestead Change. This is unfinished work from last period. Late in June, 1905, it was decided to increase the lot areas of the Honomu homesteads, making an average area of 31.14 acres instead of 20.2 acres. One lot has been taken out of the subdivision and $1\frac{1}{3}$ miles of roadway thrown into lots. The number of lots in the subdivision is now 22 instead of 36. Points already marked were used for the new lot corners, and all the field work done to conform to the amended subdivision was the running of one or two lines and the re-numbering of the lots, taking altogether but a few days in August, 1905.

Hilo High School Lot, etc. In the early part of December, 1905, the Superintendent of Public Instruction arrived in Hilo to select the location of the new high school. Our assistant in Hilo surveyed the proposed school lot and the adjoining hospital lot and buildings, and furnished the Superintendent with a plan of same. The final site decided on, however, was not the one surveyed, but the lot situated on the opposite side of the street.

Hakalau School Lot. This lot is situated in the government land of Hakalau-iki on the government road, and contains 1.893 acres. It was surveyed and marked in December, 1905, buildings, fences and surrounding topography located, and the plan and description completed.

Kaumana School Lot. This lot, containing 2.0 acres, is the proposed new school site, and is situated in Lot 21 of the Ponahawai Lots, on the Kaumana road, about 4 miles from Hilo. It was surveyed and marked in December, 1905.

Waiakea-kai School Lot. This lot is situated in Waiakea, near the Hilo railroad depot, on the proposed Front street extension. It was surveyed in December, 1905, as fenced, and contains 0.60 of an acre.

Waiakea-uka School Lot. This lot is situated in the land of Waiakea on the Volcano road and about 3 miles from Hilo. It

has an area of 1.0 acre and was surveyed and marked in December, 1905.

Honomu School Lot. This lot was surveyed in August, 1906, in order to determine whether it was properly located and had its full area. Such was found to be the case. Area 2.29 acres.

Kaumana House Lots. There is a strip of government land between the Kaumana homesteads and the Kukuau boundary which has been occupied for some time by squatters. It having been determined to subdivide the land into house lots, work was commenced in March, 1906, and finished in a short while. The 73 lots in this subdivision, situated about 4½ miles from Hilo on a branch of the Kaumana lava flow of 1881, front on both sides of the Kaumana road, and are 50x100 feet in size.

Kaiwiki Homesteads. The lease to the Hakalau Plantation Co. of the Kaiwiki-Wailea Tract expired in June, 1906, and steps were at once taken to subdivide the tract into homesteads. Three thousand eight hundred thirty-four acres of this tract are in the Hilo Forest Reserve, leaving about eighteen hundred acres available for homestead purposes.

A topographic and location survey of the portion from the makai line of the forest reserve to the sea was first made, followed by the road location and subdivision into lots.

There are 55 lots in this subdivision, the average area of the makai lots being 28 acres, and of the mauka lots, 40 acres. The total area of the homestead lots is 1766.81 acres; the makai portion of about 1180 acres is first class cane land, the mauka portion is in forest but capable of being turned into good cane land. Five and a third miles of road of a maximum grade of six per cent. run through this tract, connecting with the government main road and giving access to all the lots. It is perhaps unnecessary to state that the road lines are staked out and all lot corners marked and numbered, as this is the general rule in all subdivisions.

The gulch land between the mauka part of this subdivision and the Honomu homestead recently subdivided, is reserved for forest and water purposes. Area about 95 acres.

The survey was commenced in July, 1906, and finished in November, the work being interrupted, however, by the assistant in charge attending the sittings of the Kahua boundary hearing hereunder reported. The map and calculation of lot areas is completed.

The Wailea portion of the Kaiwiki-Wailea Tract is of very small area and not in a suitable location for subdivision with the

Kaiwiki homesteads. It adjoins the government land of Hakalau-iki and it is recommended that it be subdivided with that tract when it is thrown into homesteads.

Opea-Peleau Homesteads. The lease to the Hakalau Plantation Co. of the Opea-Peleau Tract expired in July, 1906. Two hundred thirty acres of this land are in the Hilo Forest Reserve, leaving the balance available for homestead purposes. During the months of September, October, and November, 1906, a detail survey was made of the portion from the makai line of the forest reserve to the sea, and a subdivision into homesteads followed in due course.

In addition to the regular topographic and location survey, a careful study was made of the boundaries of the grants in this section.

The subdivision consits of 19 lots, with an average area of 36 acres, and a quarry site of half an acre. The total area of the homestead lots is 684.6 acres; the makai portion of about 410 acres is first class cane land, the mauka portion is in forest, but is capable of being turned into good cane land.

Five miles of road, connecting with the government main road, with a maximum grade of six per cent. run through this tract. giving access to all the lots.

The map, calculations, lot areas, and descriptions of surveys of lots were all completed in the early part of December.

Lepeloa-Kauniho Survey. The lease to the Hakalau Plantation Co. of the Lepeloa-Kauniho Tract expired on January 1, 1907. It being the intention to also subdivide this into homesteads upon the expiration of the lease, a detail and boundary survey was made at the same time as the Opea-Peleau survey, the two tracts adjoining each other.

After a careful study of the Lepeloa-Kauniho boundary certificate and the original titles of the private land of Umauma adjoining, the assistants on the ground are of the opinion that the government is entitled to a larger area than that shown on the plantation maps, and that former locations of the land of Umauma (owned by the Bishop Estate) encroaches on this tract.

The total area of this tract is 308.0 acres, and the encroachment amounts to 82 acres.

The title study, field and map work has been completed and the results will be submitted to the trustees of the Bishop Estate for their consideration.

Kahua Boundary Case. This case has caused a great deal of interest to all parties concerned and is still undecided, the decision of the Commissioner of Boundaries not yet being given.

Some time in the early part of 1906, the Pepeekeo Sugar Co., owners of Kahua 2nd, an award by name, (unsurveyed land), made application for a certificate of boundary on a portion of same on a survey by A. B. Loebenstein of Hilo.

One of our assistants, being in Hilo at the time the notice of hearing was published, made a thorough study on the ground of the survey of the applicants, and came to the conclusion that about 75 acres of good cane land included in the description of survey in the application was really a government remnant.

On this statement of the facts, the Territory through the Attorney-General and the Commissioner of Public Lands objected to the issuance of a certificate to the Pepeekeo Sugar Co. on this government remnant .

After several postponements and delays, the hearing finally came up in September and lasted for over two weeks.

The Pepeekeo Sugar Co. first claimed that Kahua was one land and that the award was intended to cover all of the Kahuas. The Territory on the other hand contended that there were three Kahuas; that the award covered Kahua 2nd. only, and that Kahua 1st. and 3rd. were government lands. In fact, the government granted the greater portion of Kahua 3rd. and the whole of Kahua 1st. before the award on Kahua 2nd. was finally confirmed by the Board of Commissioners to Quiet Land Titles in 1855, thus showing that the government exercised ownership over these lands in the early fifties.

The remnant claimed by the government is the remaining portion of Kahua 3rd. and is situated at the head of the Kahuas, the exact area being 73.17 acres.

The Pepeekeo Sugar Co. also claimed that the boundary of Kahua 2nd. included this remnant in addition to 11.10 acres more which the Territory conceded to be all that there was of Kahua 2nd. in this upper section.

The department is thoroughly satisfied from the study of the original notes of survey, the identification of points mentioned therein, and through the examination of kamaainas that the contention of the government is a proper one.

Makaoku Subdivision. This tract was subdivided in December, 1906. It is situated in Waiakea, on the beach near the old "Kinau" wharf, and is opposite Cocoanut island.

There are 54 lots in this subdivision varying in area from 5000 to 15,000 square feet, which are to be sold as house lots; the total area subdivided being 10.6 acres.

Streets run through this tract and water mains are laid in some of them. The greater portion of the beach is reserved to the government.

The land is at present mostly covered by wild guava and lantana.

HAMAKUA DISTRICT.

Paauhau School Lot. This lot was surveyed and marked in December, 1905. It is situated on the lands of the Paauhau Plantation Co., on the plantation road and near the offices and contains 2.00 acres. Plan and description completed.

Honokaa Section Re-survey. In October, 1905, the line between the Ahualoa Homesteads, 2nd. Series, and the Honokaa Homesteads was re-run and three of the lots in the Honokaa section were re-marked.

KOHALA DISTRICT.

Makapala School Lot. This survey, made in December, 1905, to locate the original school grant in Makapala, entailed a title and boundary study as the lot was surrounded by many kuleanas

The survey determined the fact that the lot as fenced for the past fifteen years is in its correct location.

It is situated on the Niulii Plantation lands, not far from the government road and contains 1.55 acres.

Hawi Section Survey. The government lands of Kahei, mauka and makai; of Hualua, mauka, middle and makai; and of Opihipau-Hukiaa, all in the Hawi section were surveyed and permanently marked during the months of April and May, 1906. Of course, the private lands, grants and kuleanas, adjoining, were also surveyed and marked.

In addition, the sea coast and the Kohala Ditch line were located.

The seven government tracts in this section, including the Puuepa-Kokoiki tract surveyed a few years ago, aggregate an area of 2009.3 acres, the land being agricultural, a portion of which is planted in cane. The new Kohala ditch runs across the mauka parts of these tracts.

KONA DISTRICT.

The following school lots were surveyed and substantially marked on the ground during the month of March, 1906, and the plans and descriptions completed;

Papa School Lot. This lot is situated in the land of Papa 1, on the mauka side of the government road, makai of the Papa homesteads, and includes the old school lot. Its area is 0.656 of an acre.

Hookena School Lot. This lot, containing 7.43 acres, is situated in the land of Kauhako, on the government main road, about three miles mauka of Hookena landing, and adjoins the new court house lot.

Honaunau School Lot. . This lot is situated in the land of Honaunau, not far from the mauka government road and contains 1.54 acres.

Keauhou-uka School Lot. This lot is situated in Keauhou 1, on the government road to Kailua, and contains 0.961 of an acre.

Keauhou-kai School Lot. This lot, area 0.253 of an acre, is the original school grant and is situated in the makai part of Keauhou 1, near the sea. It is not used for school purposes, a church occupying the lot at the present time.

Kalaoa School Lot. This lot is situated in Kalaoa 4, on the government main road, and near the Akahipuu homesteads, and has an area of 0.605 of an acre .

Makalawena School Lot. This lot, containing an area of 0.97 of an acre, is situated in Makalawena, near the sea shore, a trail leading from it to the government road.

Hienaloli Boundary Survey. Hienaloli I is one of the lands set aside years ago by the government for the support of schools. It had never been surveyed, but since its transfer to the Public Lands Department, a settlement of its boundaries was found necessary.

So in April, 1906, one of our assistants commenced a boundary survey of this land and upon the completion of same, application was made for a certificate of boundary.

The results of the survey differed somewhat from what adjoining owners had understood was the boundary and there was a contest at the boundary hearing held in Kailua in November, 1906. The hearing is over, but the Commissioner of Boundaries has not yet given his decision.

This land contains 200.39 acres. It is not very valuable land, but is of some importance from the fact that it is the only government land giving access to the Honuaula homesteads and the Honuaula tract mauka.

Honuaula Tract Re-survey. Several changes having been suggested in the areas and locations of the proposed forest reserve

and the leased land in this tract, it was necessary to make a re-survey of the upper section.

At the same time it was found that the boundary between this land and Kaupulehu (Bishop Estate land) as formerly surveyed did not agree with the original points on the ground although run out according to the certificate of boundary of Kaupulehu. This was caused by an error of calculation in compiling the description of survey of Kaupulehu made several years ago.

So our assistant changed the lines to their correct places, and then surveyed and marked the proposed forest reserve and the leased land.

The area of the Honuaula Forest Reserve as finally created is 665 acres. It is the smallest reserve in the Territory but an important one as it includes many of the indigenous forest trees of Hawaii.

The leased land just below the forest reserve contains 1608 acres, and is used as a pasture land.

There is an unleased portion above the forest reserve of an area of 646 acres and another unleased tract of 1605 acres makai of the leased land, between same and the homesteads.

This work was done in February, 1906, and map and descriptions are completed.

Alika Homesteads Re-survey. The boundary lines between Lots 1 and 2, and between Lots 3 and 4, of the Alika subdivision, were re-marked during the first half of September, 1906.

The lines were cut through and points marked on them when the land was subdivided in 1903, but since then many of the stakes have been lost or destroyed.

The lots are from 4 to 5 miles in length and covered with forest.

A location line for the homestead road along the makai boundary of this tract was run at the same time.

Upper Waiaha II Homesteads. In the latter part of September, 1906, the subdivision of the upper Waiaha lots was made.

The subdivision is situated above the old Waiaha homesteads, and consists of 5 lots with an average area of 38 acres and a water reserve of 0.25 of an acre in which are two waterholes that never go dry and are used by the cattlemen in the dry season.

The total area of the homestead lots is 189.63 acres, the two makai lots when cleared will be suitable for cane, the lands of the Kona Plantation are just below them. Although the mauka lots are covered with forest trees, the underbrush, however, is being rapidly destroyed by cattle.

One mile of roadway runs through the subdivision connecting with another road running through the old Waiaha homesteads to the main government road makai.

The land in the upper Waiaha lots is a series of rises and flats, the latter being patched a great deal with small swamps. There are also a few ravines with but very little running water in them. Although this is a well watered tract, it is so only by virtue of the heavy forest on it. The cattle are rapidly thinning it out and with the forest will go the water.

Honalo Boundary Survey. The upper part of Honalo is a government land now occupied under a right of purchase lease. The lessee was not able to find the boundary marks of the land so it was necessary for this department to establish the proper boundaries.

In October, 1906, our assistant surveyed the tract, locating a few former marks, stone wall, etc., and made a study of the titles adjoining.

The boundaries have been thoroughly marked by ahus at the corners and along the lengthy sides.

The tract contains about 730 acres.

Kalama Boundary Survey. This is a tract of government land above the Kalamakowali homesteads, in the Kealakekua section of Kona. The boundaries on some of the sides being uncertain, it was necessary to have the same permanently established, as a lease of the tract has just been made.

Our assistant surveyed this land in the latter part of October, 1906, and found the upper boundary to be very indefinite at a point where this tract and two other lands form a junction.

The results of the survey show the area of Kalama to be considerably less than that shown on the map in the office.

A plan and description has been compiled giving the area of the tract as 284.20 acres.

Kaapuna-Kipahoehoe Boundary Survey. Kaapuna is a private land and Kipahoehoe a government land. Neither one has ever had its boundaries settled, so when forest trees in this section were being felled and sold by the owners of Kaapuna, it was uncertain whether they were on the land of Kaapuna or Kipahoehoe.

In the early part of November, 1906, our assistant undertook to run out the boundary between Kaapuna and Kipahoehoe.

A point on the government road was shown to him by three kamaainas as being on the boundary, and the line from there down to the sea is practically the same as adopted by other surveyors.

But from the road mauka, no information or kamaaina evidence could be gathered as to where the boundary might be. So an arbitrary line was run up and marked for a distance of 2600 feet for the guidance of the men cutting the trees.

At present, the department has no funds to make a thorough study and survey of Kipahoehoe, but it is work which should be taken up in the near future.

KAU DISTRICT.

The following school lots in Kau were surveyed and marked on the ground, and plans and descriptions of each completed.

Naalehu School Lot. This is a school grant re-located and marked. It is situated in Kawala, near the government road to Honuapo, and not far from the Kaunamano homesteads, and has an area of 1.25 acres.

Waiohinu School Lots. The Waiohinu school grant, situated in said land and on the government road was re-located and marked. Area 0.876 of an acre. The teacher's cottage lot is not far from the school and was also surveyed and marked. Area 0.887 of an acre.

Hilea School Lots. The school grant in Hilea, containing 17,424 square feet, was surveyed, but being too small, is unused and unsuitable for school purposes. Another lot was surveyed. taking in the present school premises and increasing its area to 3.88 acres. This lot is situated in Hilea village on the government road.

Keaiwa School Lot. This is an unused school grant situated in Keaiwa, on the road to Kapapala, and has an area of 3.705 acres.

Pahala School Lot. This lot is situated on the road to Kapapala, in Paauau 2 (Bishop Estate land) and takes in the present school premises, increasing the area to 3.705 acres. It is to be deeded to the Department of Public Instruction in exchange for the Keaiwa school grant.

Kaunamano Homesteads. The lease of the Kawala-Kaunamano Tract to the Hutchinson Sugar Plantation Co. expired in October, 1905, and preliminary surveying of the land was commenced late in September of the same year.

As is usual, a detail and topographic survey was made prior to the subdivision. The detail and topographic survey of this tract included the placing of many triangulation stations, the locating and marking of the boundaries, the running and marking of the makai line of the forest reserve, the locating and marking

of the grants and kuleanas, there being quite a number of them, and the locating of roads, gulches, streams, pipe lines, springs reservoirs, cane, pasture, and waste lands, and the coast line.

Elevations in different portions of the tract were also taken.

Three hundred eighty acres are in the forest reserve, a section of 345.5 acres is waste pahoehoe land, and the balance of the tract is subdivided into homesteads.

The first subdivision gave an average of 55 acres to the lot, either cane, or part cane and part pasture land. The pasture land was subdivided into lots from 50 to 150 acres to suit the conditions of the ground.

This subdivision was later changed giving an average of 25 acres for lots in cane or partly in cane, and the pasture land divided into lots varying from 35 acres to 155 acres.

There are 57 lots in the subdivision with a total area of 1941.82 acres. At the time the survey was made, 964.72 acres were in cane and 977.10 acres were used for pasture land. In this subdivision, there are four small lots reserved for quarries with a total area of 12.65 acres.

The government main and two branch roads run through the tract besides the plantation roads. In addition, 6 miles of homestead roads were surveyed and located, giving access to all the lots. These roads have a general grade of six per cent. sometimes increasing to eight per cent. for short distances.

Map completed and lot areas calculated.

Kioloku Survey. Kioloku adjoins Kaʻnamano and is what is called an unassigned land, i. e., a land that was overlooked and left out in the Great Mahele of 1848 when Kamehameha III divided the lands between the people, the chiefs, the crown and the government, and is now considered a government land.

The survey of Kioloku was made at the same time, and in the same manner, as the detail and topographic survey of Kawala-Kaunamano.

Two hundred sixteen acres are in the forest reserve, the balance of the land consists of 282 acres of cane land and 354 4 acres of pasture land.

Map and description of survey completed.

Hionaa-Kaalaiki Survey. The leases of the Kaalaiki and Hionaa-Hokukano tracts have expired. The greater part of these tracts, some 11,050 acres, is now in the forest reserve. The balance below the forest reserve is in one piece and is now more properly called the Hionaa-Kaalaiki Tract.

The survey of this land was made after the above mentioned surveys and in the same manner. There are 401 acres of cane land and 1799 acres of pasture land in this tract, exclusive of grants and kuleanas. Map and description of survey completed

Kaalualu Remnants. There are two government remnants at the old Kaalualu landing which were surveyed and marked at this time. One is kula land and contains 6.37 acres; the other is a fish pond and contains 3.53 acres. Plan and descriptions completed.

Puueo Lots. A portion of Puueo containing 321 acres was surveyed and marked in 1903. An application having been made for only a part of the lot, it was divided at this time into two pieces. The mauka lot contains 190.5 acres, about 72 acres being free from rocks; the makai lot contains 130.5 acres and is all pahoehoe land. Descriptions of the two lots have been compiled.

Kau Forest Reserve Survey. The Kau Forest Reserve extends from the Kahuku boundary on the West to and including a portion of Kapapala on the East, a distance of about 22 miles, and covers all the forest land in this section. At the Kahuku end, it is about 6 miles wide, at the Kapapala end, it is about 3 miles wide.

The mauka line of the reserve runs along the Kahuku boundary, the makai line is back two to four miles from the sea coast and crosses eleven government lands and six private lands.

The reserve has an area of 65,850 acres, 6,232 acres of which are owned by private parties.

The work in connection with this survey was the locating and marking of points along the makai line, 19 forest reserve monuments and 7 other marks having been placed thereon; the locating of the Kapapala and Kahuku boundary fences along the mauka line, 1 forest reserve monument and 1 triangulation station being placed on this line, the rest of the line being marked by the fences; the extending of the triangulation system on the Kapapala end of Kau; and some topographic work. Map and description completed.

All the above work in Kau was done during the months of October, November and December, 1905, and January and February, 1906.

Kiolakaa-Keaa Surveys. In October, 1906, Lot 12 of the Kiolakaa-Keaa homesteads was re-marked, the former marks having been lost.

At this time, a location survey was also made of a proposed change of a part of the homestead road in this subdivision. The

proposed change is requested by some of the homesteaders and is 2600 feet in length passing through lots 21, 25 and 26 and will be easier in grade and cheaper in constructing than the former road.

Kapapala Survey. Kapapala is an immense tract of public land that reaches from the South coast of Hawaii to the summit of Mauna Loa, a distance of approximately 24 miles, and has a breadth of something like 15 miles, giving it an area of over 170,000 acres.

The survey of this land was commenced in July, 1906, and the field work completed the latter part of December. The mapping has been carried on as much as possible during the course of the field operations, and will soon be brought to completion.

A very extensive triangulation system was carried from the sea up to the 7000 foot elevation, there being some 200 odd stations established. Owing to the lay of the land, in many places where the country was wooded, triangulation methods could not be used and miles upon miles of traverse were run in order to obtain the necessary data. Some 50 odd miles of fencing was located, and permanent marks placed along the government road for a distance of 18 miles.

It may be of interest to scientists to know that an accurate location of the crater of Halemaumau determines the fact that it has not moved in position since it was surveyed in 1886.

The lower portion of the land, which includes the Kau Desert, is covered by sharp aa flows, waste pahoehoe, moving sand piles, a great many volcanic cones, scrub ohia, and is made almost impassible in many places by numerous large volcanic cracks and palis; in one place the pali has a sheer drop of 1500 feet.

In this large makai area are to be found a number of kipukas, ranging in size from 50 to 1000 acres, and containing about 6000 acres that is excellent grazing land in the rainy season.

Mauka of the government road and between the 1881 flow and the land of Keauhou, the country is composed of a great many aa and pahoehoe flows and kipukas, the latter in places being densely wooded with koa and mamane, and generally covered with heupueo grass, the best Hawaiian feed grass. These kipukas run up to an elevation of 7000 feet and contain an area of some 6000 acres, of which 2500 acres between the 4000 and 5000 foot elevation is excellent agricultural land, having a good soil, 10 feet deep in places.

On the Pahala side of the 1881 flow, the country is somewhat open, with scattering parcels densely wooded. These parcels vary greatly in quality, there being thousands of acres of fine

grazing land covered with manienie and imported grasses, and thousands of acres covered with rank grasses of little worth.

In addition to the 743.5 acres of cane land, there is in all some 50,000 acres of good pasture land, not including about 7000 acres in the forest reserve.

Our assistant makes special mention of the valuable services of Keanaha and Kawailohi, two Hawaiian cowboys, who proved to be excellent guides and workers, and particularly useful in many ways. In addition to other duties, they did all of the horse shoeing, and it might be said that much of this was needed for the reason that new shoes would only last a few days over this rough land where so much lava is to be crossed.

ISLAND OF MAUI

Olowalu School Lot. A survey of the proposed new school lot at Olowalu was made in January, 1906. It is situated between the sea and the plantation railroad, has frontage to the government road and contains an area of 1 acre. Plan and description completed.

Hamakuapoko School Lot. This was a location of the present school premises in Hamakuapoko, surveyed in order to ascertain if it occupied the correct boundaries of the school lot deeded by the Haiku Sugar Co. to the Board of Education in 1887.

The lot is situated at the junction of the government roads to Haiku and to Maliko and contains an area of 0.95 of an acre.

As the Department of Public Instruction wished to acquire a piece in the rear in order to enlarge the lot, it was surveyed and found to contain 0.58 of an acre. Plan and descriptions of the two pieces were furnished the Department of Public Instruction.

Paia School Lot. The present school lot in Paia, area 0.75 of an acre, is situated a short distance back of the Kaheka-Makawao road. The Department of Public Instruction wished to enlarge it by acquiring the piece between it and the road. This piece has an area of 0.51 of an acre.

Both pieces were surveyed and marked, buildings located and a plan and descriptions completed.

Kihei School Lot. This lot containing 4 acres is to be the new site of the Kihei school, and is situated in the land of Waiakoa adjoining the Kihei Plantation. Surveyed and marked on the ground and plan and description completed.

Huelo School Lot. This is to be the new site of the Huelo school and is situated in Mokupapa not far from Huelo village.

It is located on the new Kailua road and has an area of 5.32 acres. Surveyed and marked and plan description completed.

The above four school lots were surveyed in the month of March, 1906.

Waihee School Lot. The present Waihee school lot is situated in Waihee a little back of the road to Wailuku and contains 1.8 acres. Between it and the road are three pieces of land which the Department of Public Instruction wish to acquire.

These three pieces and the school lot were all surveyed in August, 1906, and a plan and descriptions completed; the total area being 2.34 acres.

Keanae Homesteads. The Keanae homesteads, situated in the makai part of the Keanae Flat, Koolau, were subdivided in the latter part of October, 1905. There are in this subdivision 16 rice or taro lots, averaging 0.75 of an acre and 16 kula lots averaging 11.9 acres. The kula land is in a different locality from the taro land, but each kula lot has its corresponding taro lot. Total area of taro lots, 11.98 acres, and total area of kula lots 19.06 acres.

Roads run along all the kula lots and a few of the taro lots, the inside taro lots being reached by crossing the kuaunas.

Map completed and lot areas computed.

Wailua Homesteads. The Wailua homesteads, situated on the Waialua Flat, Koolau, are not far from the Keanae homesteads, and were subdivided in a similar manner. The subdivision was commenced and finished in the month of November, 1905.

There are 47 rice or taro lots averaging 0.66 of an acre and 47 kula lots averaging 1.72 acres. Total area of taro lots, 30.92 acres and total area of kula lots, 81.0 acres.

Roads run along all kula lots. Map completed and lot areas computed.

Catholic Church Lot. At the same time as the above subdivision, a lot of 4 acres on the Wailua Flat, applied for by the Catholic Mission, was surveyed and marked out, and plan and description completed.

Olinda Survey. Application for purchase was made for what is known as the "Olinda" premises, a portion of the government land situated in the mauka part of Makawao on the mountain road to Haleakala. The lot, containing an area of 70.50 acres, was surveyed and marked out in December, 1905, and the plan and description completed.

In March, 1906, another lot across the mountain road opposite the "Olinda" premises was surveyed and marked out. This one has an area of 38.20 acres. Plans and description completed.

Haleakala Tract Survey. The mauka part of Makawao is government land, formerly a school land, and is called the Haleakala tract. The survey of this tract was made during the months of December, 1905, and January and February, 1906. It included the marking of the boundaries and a general detail and topographic survey.

The tract has an area of about 4550 acres and is good pasture land. Through press of other urgent work, the map has not been completed.

Omaopio Homesteads. The subdivision of the Omaopio homesteads in the district of Kula was made during the months of June and July, 1906.

The detail survey included the marking of boundaries of this land and of a few grants and kuleanas, the location of roads, ditch, right-of-way, gulches, etc., and the taking of elevations over the tract.

There are 20 lots in the subdivision, averaging 51 acres; 1 reserve of 13.3 acres and 2 remnants in the upper setcion of 13.15 acres and 14.33 acres, all of which make a total area of 1065.88 acres.

Five and a half miles of roadway were required to give frontage to these lots which consist of fair grazing land pretty well covered with cactus.

Hanehoi Survey. In the survey of Hanehoi and West Hanawana, district of Hamakualoa, made in August, 1906, the portion below the makai line of the Koolau Forest Reserve to the sea included a general detail and topographic survey, such as the locating of grants and kuleanas, of the "Hamakua" and "Lowrey" ditches, roads, gulches, etc.

The portion above the new government road is densely wooded and covered with a rank growth of grass, but is first class pasture land.

In Hanehoi there are 161.8 acres and in West Hanawana, 109.5 acres. Makai of the road, is a large piece of government land well cut up with gulches, but containing good pasture land; area 53.0 acres.

Six new triangulation stations, marked by galvanized pipes and concrete bases, were established at the time of this survey.

ISLAND OF KAUAI.

Kapaa Homesteads. The subdivision of the Kapaa homesteads, commenced in May, 1906, was stopped the first of July, 1906, on account of the failure of the Molokans to fulfill their agreements.

School Lots. After the Kapaa work, the following school lots were surveyed and marked: Anahola school lot, situated in Anahola, area 5.00 acres; Koolau school lot, situated in Lepeuli, area 2.00 acres; and the Hanamaulu-kai school grant, situated in Hanamaulu, area 2.03 acres.

Forest Reserve Monuments. Nine forest reserve monuments were placed along the makai line of the Kealia Forest Reserve and the proposed extension thereof, running through the lands of Anahola, Kamalomalo, Kealia, Kapaa, Waipouli, Olohena and Wailua.

Government Survey Triangulation Stations. The original Government Survey triangulation stations "Cone Peak or Hakunui," "Kalepa," "Laaukahi," "Kilohana" and "Paa" were recovered and marked with galvanized pipes and ahus.

Kalaheo Homesteads. The land of Kalaheo is situated in the district of Kona and is at present leased to the McBryde Sugar Co. Arrangements were made, however, to have homesteads subdivided in this land before the expiration of the lease, so in April, 1906, work was commenced.

By the end of the month a subdivision comprising 36 lots, averaging 5.77 acres, was completed and shortly after opened for settlement.

About the middle of July, 1906, a further subdivision was made and completed by the end of October, in which the average acreage was increased to about 15 acres.

Altogether there are 93 lots in this subdivision with a total aera of 895.24 acres; also 3 spring reserves, area 34.04 acres; 3 reservoir sites, area 55.55 acres and 8 miles of road running throughout the tract which consists of fair agricultural land.

In connection with this survey, two tracts below the homesteads were surveyed and marked, areas 178.2 acres and 156.1 acres; and the proposed forest reserve line run, the area in said reserve being about 1250 acres. Between the homesteads and the forest reserve, is a section of 183 acres of steep, rough and wooded land unsuited for homestead purposes.

The detail survey included the placing of 19 new and the re-marking of 5 old triangulation stations in addition to the boundary work, the locating of kuleanas, roads, rice land, and general topography.

Kalaheo School Lot. This lot, containing 2.82 acres and situated on the government road directly below the homestead subdivision, was surveyed and marked at the same time.

Hanapepe School Lot. This lot, 1 acre in size, occupied by the present school, is leased from Messrs. Gay and Robinson, and owing to the uncertainty of the boundaries, a survey was made of it and the corners marked.

Kekaha School Lot. This lot contains an area of 1.25 acres and is situated on the government road about one-fourth of a mile from Kekaha village. It was surveyed and marked.

Makaweli School Lot. This lot was substantially marked on the ground and is situated in Makaweli near the mill, and contains an area of 1.38 acres.

Koloa School Lot. This lot situated in Koloa village was surveyed and marked and contains an area of 1.50 acres.

The last four school lots were surveyed after the completion of the Kalaheo survey, and in order to properly reference them it was necessary to carry the triangulation across from Kalaheo causing the placing of 6 new sections and the re-marking of 1 old one.

Halelea Forest Line. The makai line of the Halelea Forest Reserve was moved mauka about half a mile along its entire length, on account of the land between the new and the old line having been applied for, for the cultivation of rubber.

Tweleve forest reserve monuments were placed on this new line and connected up by triangulation.

Waioli Survey. The detail survey of the portion of Waioli below the forest reserve was commenced in November, 1906, and finished in the first week of December.

The boundaries were run and marked, grants and kuleanas located by kamaaina evidence, and also the rice and taro lands and other topography located.

The map not being completed, only the approximate area of the government land can be given, which is about 800 acres.

Hanalei Homesteads. An additional subdivision was made to the Hanalei homesteads which were subdivided in 1904.

Four kula and taro lots, 13 all kula lots, and 13 all taro lots, were marked out. The lots average 1 acre of taro land and 2

acres of kula land. Altogether 30 lots were subdivided with a total area of 53 acres.

The land is situated in the Hanalei Valley on the banks of the river about 4 miles from Hanalei village, and is first class taro land and fair agricultural land.

ISLAND OF OAHU.

Palolo Valley Kula and Taro Lots. The fifteen acres of kula and taro land below the Palolo homesteads were re-subdivided for native homesteaders early in July, 1905, into 14 lots of an average area of 1 acre, about a third being taro land, the remander kula land. Total area 14.98 acres. Map completed and lot areas computed.

Alewa Heights Lots. Alewa is a government ili on the plateau-like ridge just above the North end of Judd Street between Nuuanu and Kalihi valleys.

The subdivision of this land, area 115.6 acres, was completed in November, 1905.

With road and water facilities, this tract will be one of the best resident subdivisions the government has to offer the public.

Connecting drives from the upper ends of both Judd and Wyllie streets have been located, and all map work in connection with the survey completed.

Makiki-Manoa Survey. A detail survey of the land on the slopes of Round Top and Sugar Loaf between the Manoa road and Makiki valley was commenced in August, 1905, for the purpose of subdividing it into lots.

About the middle of September, other urgent work being called for, this survey was discontinued.

Before the survey was stopped, however, our assistants had made a location of carefully selected roads through the tract and done all the preliminary work necessary for the final subdivision.

The roads have been planned to make the best of connecting drives to the Tantalus mountain road from the Makiki section.

One branch of the road will run from a point in Makiki Valley to the ridge East of the Lunalilo Home pasture lands and connect with Tantalus Drive on "Forest Ridge." The other traverses the slopes of Round Top and Sugar Loaf in beautiful serpentine curves and finally reaches the same mountain drive at a point North of Sugar Loaf pond.

As this will no doubt make the most attractive drive in the vicinity of Honolulu, special consideration has been given to the location for scenic as well as practical purposes.

Makiki Slope Lots. About 9 acres of government land on the slopes of Makiki hill at the head of Keeaumoku street were subdivided into 5 lots and sold at public auction.

The proposed branch road from Makiki valley to Tantalus Drive on "Forest Ridge" will give frontage to these lots.

Kanohuluiwi Homesteads. The government remnant of Kanohuluiwi, in the district of Koolaupoko, was subdivided in January, 1906, into 5 lots containing 30.5 acres of kula land and 17.7 acres of rice land, the lots averaging 9.7 acres.

A forty foot road runs along one side of this subdivision and connects with the government main road.

Keaalau Survey. The land of Keaalau, in the district of Koolaupoko, consisting of 60.4 acres of pasture land and fish pond of 7.5 acres at the sea shore, was surveyed and substantially marked on the ground at the same time as the above.

Hauula Homesteads. A portion of the Hauula homesteads, in the district of Koolauloa, was re-subdivided and marked into 14 lots with a total area of 111.61 acres ,and a short road located.

Lualualei Surveys. The lease of a portion of Lualualei, in the district of Waianae, being about to expire, a survey was made in April, 1906, and the map completed, to ascertain the amount of land planted in cane. There are 3332 acres in this tract, 1058 acres being in cane and the balance fair pasture land.

In March, 1906, a survey was made of the portion of Lualualei between the sea and the above mentioned tract. The land in this section is covered with deposits of lime. Two lots with a total area of 396.8 acres were marked out, and map and descriptions of surveys completed.

At the same time, a new location was made of the proposed change in the government road at this place.

Waianae-kai Check Survey. The proposed sale of a portion of Waianae-kai made it necessary to have maps giving areas of the cane, pasture and waste lands, and other data.

The Waianae Co. having a complete detail map of this section, all that was necessary for this department to do was to check the work.

The land extends from the Waianae-kai Forest Reserve and the flume line to the O. R. & L. Co. right-of-way, and has a total area of 1231 acres. Grants and kuleanas take up 232 acres, leaving a balance of 999 acres of government land. Out of this,

171.65 acres is reserved to the government for proposed homesteads, court house lot, etc., leaving a net area of 827.35 acres, of which 336 acres is in cane.

Map and descriptions of the lands sold and reserved have been completed.

Surveys for the Attorney-General. During the past eighteen months, several surveys and plans were made for the Attorney-General:

Locations for murder trials.
Wharton premises, Waialua.
Detention Camp, Kalihi.
King street near Kamehameha IV road, Kalihi.
Waipahu, Ewa.
Dwelling house at Kahuku.
Houses on Ditch street, Kakaako.

A survey was made and the map and descriptions completed of the roads in Waiahole, Koolaupoko, and of a government remnant in Onouli, the work being made necessary by the application before the Court of Land Registration for registered title without reserving the government's interests.

A survey was made of a portion of the government land in Lualualei on which wood had been cut by private parties. The Attorney-General brought suit against them and desired to have an accurate location of the portion cut.

A survey was made of the bulkheads along Waikiki beach from Ala Moana to Kapahulu. It was thought that the owners of land fronting on the beach had been building their bulkheads beyond their title lines and an accurate location was necessary to determine the facts.

Measurements along the car tracks of the H. R. T. & L. Co were made to ascertain the speed of the cars.

School Lot surveys. The rear boundary of the Royal School premises was staked out, and elevations were given for the grading of the Normal school lot.

The proposed new school lot of 4.33 acres at Kalihi-waena was surveyed and staked out, and the plan and description completed.

The proposed new school lot in Waialua situated in the land of Kawaihapai, and containing an area of 0.50 of an acre, was surveyed and staked out. Plan and description completed.

The Moiliili school grant with an area of 1.73 acres, was surveyed and staked out.

Various surveys were made in Pauoa valley for the new Pauoa school lot location and proposed exchanges. The location finally

selected is in the government land of Kapalaoa on the proposed new Horseshoe road, and has an area of 1.49 acres. Plan and description completed.

Miscellaneous Surveys.

A survey was made of the Waikiki swamp lands to the extent of 687 acres including locations and levels, and plans, together with specific areas, were furnished the President of the Board of Health for reference in connection with the reclamation plan.

Government remnants in Kalihi valley.

Government remnant near Lunalilo Home. Application for purchase.

Government lot on Smith Street. Old Mission School premises.

Government lot opposite the Police Station. Old Sailors' Home premises.

Government fish pond of Kuwili in Iwilei.

Government lot in Nuuanu Valley. Application for purchase.

Reserve in Makiki Valley for Honolulu Water Works.

Government lot on Punchbowl Slopes. Application for purchase.

Moiliili Quarry lot.

Kapalama Cemetery.

Ii Estate land on Kalakaua Avenue. For the Director of U. S. Experiment Station.

New road at Haleiwa, Waialua.

Right-of-way for pipe line in Pauoa.

Right-of-way for pipe line in Makiki.

Re-placed two street monuments on Punchbowl Street.

Placed a street monument in Kalihi.

Placed a monument in former position of "Kawa" Trig. Station.

Grade and line given for sidewalk around Post Office.

Grade and line given for sidewalk around government lot at the corner of Wilder and Punahou Avenues.

Pahoa Pumping Station lot re-marked.

Check survey of lane on King Street next to Winston Building.

Lot at Pukele, Palolo Homesteads, re-marked.

Check survey of building on corner of Merchant and Alakea Streets, in re. petition for registered title.

Azimuth for Young Street observed.

Government lot adjoining Post Office. Old Honolulu Hale premises.

SUMMARY OF FIELD WORK COMPLETED IN THE EIGHTEEN MONTHS ENDING DECEMBER 31st, 1906.

HOMESTEAD SUBDIVISIONS.

ISLAND OF HAWAII.

Puna District

Pahoa Village Lots re-marked.

Hilo District

	Lots	Acres	
Honomu Homesteads	22	684.13	
Kaumana House Lots	73	9.00	
Kaiwiki Homesteads	55	1,766.81	
Opea-Pelcau Homesteads	19	684.60	
Makaoku House Lots	54	10.60	
	223		3,155.14

Hamakua District.

Honokaa Homesteads re-survey.

Kona District

Alika Homesteads re-marked .			
Upper Waiaha II Homesteads..	5	189.63	
	5		189.63

Kau District

Kaunamano Homesteads	57	1,941.82	
Lot 12 of the Kiolakaa-Keaa....			
Homesteads re-marked			
	57		1,941.82

ISLAND OF MAUI.

Keanae Homesteads	32	31.04	
Wailua Homesteads	94	111.92	
Omaopio Homesteads	23	1,065.88	
	149		1,208.84

ISLAND OF KAUAI.

Kapaa Hamesteads, not completed			
Kalaheo Homesteads	93	895.24	
Hanalei Homesteads new subdivision	30	53.00	
	123		948.24

ISLAND OF OAHU.

Palolo Valley Kula and Taro lots	14	14.98	
Alewa Heights Lots	80	115.60	
Kanohuluiwi Lots	5	48.20	
Hauula Homesteads	14	111.61	
	113		290.39
Grand Total.....	670		7,734.06

SCHOOL LOTS.

ISLAND OF HAWAII.

Puna District.....	6 lots	13.480 acres
Hilo District	6 "	7.890 "
Hamakua District	1 "	2.000 "
Kohala District	1 "	1.550 "
Kona District	7 "	12.415 "
Kau District	7 "	14.703 "
ISLAND OF MAUI	6 "	15.450 "
ISLAND OF KAUAI	8 "	16.980 "
ISLAND OF OAHU	4 "	8.500 "
Total	46 lots	92.960 acres

FOREST RESERVES.

Honuaula Forest Reserve, Kona, Hawaii..... 665.00 acres
Kau Forest Reserve, Kau, Hawaii .....65,850.00 acres
Kalaheo Forest Reserve, Kauai (proposed).... 1,250.00 acres
Placing nine monuments on the Kealia forest reserve line.
Placing twelve monuments on the Halelea forest reserve line.

DETAIL SURVEYS.

ISLAND OF HAWAII.

	No. of lands	Area in Acres
Hilo District		
Lepeloa-Kauniho, boundary	1	308.00
Kahua, boundary	1	73.17
Kohala District		
Hawi Section	7	2,009.30
Kona District		
Hienaloli, boundary	1	200.39
Honuaula Tract	1	3,859.00
Honalo, boundary	1	730.00
Kalama, boundary	1	284.20
Kaapuna-Kipahoehoe boundary line		
Kau District		
Kioloku	1	636.40
Hionaa-Kaalaiki	1	2,200.00
Kaalualu Remnants	2	9.90
Puueo Lots	2	321.00
Kapapala	2	172,780.00
	20	183,411.36

ISLAND OF MAUI.

Catholic Church Lot, Wailua	1	4.00
Olinda and Makawao Lots	2	108.70
Haleakala Tract	1	4,550.00
Hanehoi and West Hanawana	2	324.30
	6	4,987.00

ISLAND OF KAUAI.

Kalaheo Tracts	3	517.30
Waioli Tract	1	800.00
10 original trig. stations recovered and marked		
19 new trig. stations established		
	4	1,317.30

ISLAND OF OAHU.

Makiki—Manoa, not completed ..		
Makiki Slope Lots	5	9.00
Keaalau	1	67.90
Lualualei Cane Lands, etc.....	1	3,332.00
Lualualei Lime Stone Lots.....	2	396.80
Waianae-kai Check Survey	1	1,231.00
Surveys for Attorney-General	10	
Miscellaneous Surveys	26	
	46	5,036.70

OFFICE WORK

The office work has not differed essentially from that of the past periods. In addition to the preparation of data for field parties, maping new surveys, checking same and computations in connection therewith, and the furnishing of information regarding land matters to callers, the following deserves special mention:

Sixty-two descriptions of survey and plans filed with Court of Land Registration petitions have been examined, and reports submitted to the Attorney-General. Some of these required a careful study of the original titles and notes of survey.

The study of the titles of fishery rights was continued from last period for the first three months of this, and reports made to the Attorney-General.

A list giving the names and areas of public lands in the territory was prepared in this office. Exact areas were given of surveyed lands, and approximate areas of all others.

Tracings showing the proposed Waikiki Reclamation tract were prepared for the president of the Board of Health, and the plans used by Chrales Mulford Robinson, the city beautifier, in illustrating his recommendations for the improvement of the city of Honolulu were prepared in this office.

Maps showing the election precincts throughout the territory in conformity with the new proclamation, were made, and copies furnished the territorial and county offices.

Observations made for standard time and the time signal service, and the direction of the tide-gauge are still under the superintendence of this office.

Maps of the counties were made for the Governor's report to the Secretary of Interior, showing school houses, post offices, public lands, homestead subdivisions, agricultural lands, such as cane, pineapple, rubber, wheat, corn, potatoes, rice, etc., pasture lands, forest lands, forest reserves, and waste lands, throughout the territory.

The description of the Waianae-kai Forest Reserve was checked, and plans and descriptions were compiled for the Superintendent of Forestry of the following forest reserves, in addition to those surveyed on the ground:

Ewa Forest Reserve, Oahu .....28,850.0 acres
Lualualei Forest Reserve, Oahu ..... 3,743.0 acres
Waialua Forest Reserve, Oahu .....23,070.0 acres
Hana Forest Reserve, Maui .....14,825.0 acres
Na Pali-Kona Forest Reserve, Kauai..60,040.0 acres

A tabulated list of all forest reserves in the territory was also compiled, giving areas of all lands in the reserves, such as government, leased and unleased, and private lands.

The elevations and geographical positions of all weather stations in the territory were checked up for the Director of the local branch office of the U. S. Weather Bureau.

The main work done in the Hilo office comprised the finishing of the Hilo City detail maps, Olaa New Tract descriptions of surveys, and tre calculation work in connection therewith. This work was commenced in the last period but has not yet been entirely finished on account of field work being taken up by the assistant in charge.

SUMMARY OF OFFICE WORK.

Descriptions of surveys finished including homestead surveys	298
Sketch plans attached to descriptions of surveys	585
Field books registered and filed	28
Tracings furnished	165
Blue prints furnished	1,249
Reports and official letters, recived	998
Reports and official letters, written	756
Maps, tracing, blue prints and charts registerd and filed	75
Total registered maps to date	2,384

EXPENDITURES AND RECEIPTS OF THE SURVEY DEPARTMENT FOR THE EIGHTEEN MONTHS ENDING DECEMBER 31, 1906.

EXPENDITURES.

Salary of Surveyor	$ 4,500.00
Salary of Chief Assistant	3,150.00
Salary of First Assistant	2,970.00
Salary of Second Assistant	2,610.00
Salary of Messenger	720.00
Expenses of Field Parties and Office Work	23,313.28
	$ 37,263.28

RECEIPTS.

Sales of published maps	$ 217.50
Tracings, blue prints, etc	220.20
Rating chronometers and time service	30.00
Professional services	199.50
Sale of junk	12.30
Data furnished	15.00
	$ 694.50

APPENDIX

Brief statements about the Survey Department written for the Report of the Governor of the Territory of Hawaii to the Secretary of the Interior for the year ending June 30th, 1906.

Honolulu, T. H., Aug. 9th, 1906.

Sir:—At your request, I have the honor to submit the following brief statements about the Survey Department.

In 1871, the humble beginning of the Government Survey was made, the force, including the head of the Survey, consisting of two men, two boys, and a few native laborers.

The conditions under which this force began its work were as follows:

A great division of lands had been made and a new tenure established in 1848. Space will not permit details of this transaction, other than the statement that the lands of the Islands were apportioned approximately as follows:

To the Government	1,495,000 acres.
To the Crown	984,000 acres.
To the Chiefs	1,619,000 acres.
To the Native Tenants	28,000 acres.
	4,126,000 acres.

Shortly after, the Government proceeded to sell much of its land at private sale at low prices, the same being selected and surveyed at the option of the purchaser, who of course, knew enough to select the "cream."

Surveyors were imperatively needed to survey the lands awarded to the native tenants as well as the tracts sold by the Government, and to meet this demand numerous surveyors came forward.

Some of these were competent and conscientious, but many were happy-go-lucky, and careless of the first requirements of a survey, and not infrequently their grotesque errors and impossible descriptions amounted almost to a display of genius.

It may serve to illustrate some of the old methods of surveying, to cite the case of one, who, by the way, had been an old surveyor of public lands in the United States, and who, when confronted with the dense jungles of Hawaii, was accustomed to send an assistant far ahead out of sight and nearly out of hearing, and then sight his instrument as best he might at the assistant's "yell" borne faintly on the breeze, after which two chainmen by any route that they found easiest, would measure a distance that was recorded with microscopic precision.

At the inception of the Government Survey in 1871, about 15,000 separate lots and tracts of land had been surveyed, mostly by loose and imperfect methods.

The Crown lands, the Chiefs' lands, and the remaining Government land were almost wholly unsurveyed, or if surveyed in any measure, generally in the crudest and most inexact manner. There were no reference points by which these surveys could be connected, and practically no maps to show the relation of the various old surveys to each other. Add to this, that while the "Great Division" of 1848 had radically changed the basis of ownership, it did not and could not change the old boundaries, and that the lands, Government, Crown, and private, were commingled in every conceivable size, shape and location; that the country has a picturesque topography of rugged mountains, deep valleys, swamp lands and arid lava flows, thick jungle and open plain; that the elevation varied from sea level to 14,000 feet, and a general, though incomplete idea of the situation may be had.

To bring order out of this chaos, to locate the old and often "crazy" detached magnetic surveys, showing the same on general maps, and thereby determining the remainder of the Government land, that it might be intelligently dealt with, was the primary object of the Survey.

Its scope, however, was continually widened in response to the needs of the public, and has included the making of all maps, exact measurements and records needed for public purposes.

It has included tide observations; time observations for local standard and Greenwich mean time; meteorological, magnetic, topographic and hydrographic work; street lines and grades for the cities of Honolulu and Hilo; the laying out of lands for settlement; and the cooperation with the Court of Land Registration in the examination of surveys for registration under the "Torrens" system.

In other words, this office has been called upon to perform many of those duties which elsewhere fall to the lot of separate bureaus or organizations.

As to the situation today, it may be said that the islands have been connected and conveyed by a triangulation scheme in accordance with the principles and methods of the U. S. Coast and Geodetic Survey. That coast lines have been surveyed, and satisfactory maps made of all the islands, excepting only the few islets of little or no importance; that good district maps of all the Islands have been prepared showing the public and private ownership; that the records of the office, growing constantly more complete, have become of inestimable value, and are resorted to by all classes of the community as their first and most necessary reference in all land matters; that all transactions as to public lands may be made with a knowledge of true conditions to the general benefit of the whole community.

Such in brief has been the result of the work of the Survey Office, and while no work of this nature can hope to be above criticism, it is a satisfaction to know that the warmest commendation of the work has been from visitors of high scientific attainments, and from those of this Territory whose knowledge of the work make criticism valuable.

At the present time the most important work of this office is the laying out of lands for settlement under the existing land laws, and the locating, marking, mapping and describing of the boundaries of the public lands and forest reservations.

While the general policy as to the disposition of public lands is directly in the province of the Commissioner of Public Lands, the connection of the Survey Department with the details of the work, and its knowledge of the situation is such that it seems proper to make here some comment on the matter, more particularly as to the application of the U. S. Land Laws and surveying methods to the public lands of Hawaii, an application that is not infrequently recommended by persons who have limited knowledge of the situation.

The area of the public land in Hawaii is about 1,700,000 acres. Of this only a limited portion will come under any form of cultivation, and a large portion of this depends on the construction of expensive roads and the success of new agricultural enterprises, yet to be proven. This area is too small to warrant the liberal allotments made under the U. S. General Land Laws, and in view of the productiveness of Hawaiian lands of good quality such allotments are in general unnecessary.

Much of the "cream" and most of the accessible portions of the public lands were disposed of many years ago; there is still considerable public land of value, but a larger part is almost worthless, such as the great lava flow regions and the precipitous, rugged nature of many mountain tracts, making occupation impractiable.

In the rainy districts, expensive macadamized roads must be built for any proper development of the lands, and in many sections, graded roads at heavy expense are indispensable to reach the elevations at which very much of the remaining public lands lie, and owing to the comingling of public and private lands such roads must in most cases cut through and across private lands thereby greatly complicating the situation.

The expense attending the building of these roads, without which the settler is at the greatest disadvantage, and the limited area suited to settlement, require a careful limit of the area alloted in order to meet the needs of as many as possible.

The U. S. system of division into rectangular blocks could be applied to any useful purpose in only a few places and unfortunately those places are for the most part the inhospitable barren localities unfit for settlement. Where the rectangular system can be applied, however, the Survey Department is only too happy to adopt it.

Many valuable pieces of public land are remnants of such size, shape, and location, that it would be simply impossible to apply the U. S. Survey System. Any consideration of Hawaiian land maps will show this. For instance, a tract of 2,000 acres has nine-tenths of its value represented by less than 100 acres at a low elevation, even this 100 acres lying in scattered remnants. It would be impossible to apply the U. S. rectangular system to these remnants below. As to the region above, even casual observation will show, that if divided at all, it must be in some conformity with the topography, if the absurdity would be avoided of having one lot on the top of an almost inaccessible peak while another lot would capture the greater part or all of the land of real value. Cases of equal difficulty would be the rule, rather than the exception.

Owing to the great differences in elevation, the marked disparity of rainfall, the differences in nature of the lava flows which have in the remote past covered great areas, and in all manner of inequalities, it is impossible to assign uniform values to land. Within the area of a small lot may be found land vary-

ing from almost nominal value to several hundred dollars per acre.

The native Hawaiian rarely cultivates over half an acre of land; this and a small area for pasturage meets his apparent needs. Many Portuguese, now American citizens, who make good settlers, are well satisfied with from 25 to 30 acres. Where the nature of the country requires, or the amount of land permits, lots up to 100 acres may be acquired.

To meet the requirements of the various classes and needs of the community, a variety of methods is needed by which the lands may be divided up and disposed of, according to the nature and location of the land, the demand for the same, and the amount to meet the demand. The present land laws were intended to meet existing conditions, and as far as possible prevent land grabbing and speculation, and have well served their purpose.

The speculative tendency in taking up land should not be encouraged. Where the opening of land can go on in a reasonable way, favorable locations being selected as to productiveness, accessibility, etc., there is a good chance of the land being utilized and the results that were hoped for achieved.

To push lands on the market in large allotments that will not and indeed cannot at present be used, means that they would fall into the hands of already large holders to whom they would be of some use in connection with present holdings. Dummies can too often be found to take up land in every country, or at least perfunctory compliance may be made with conditions until title is obtained and then for the best bidder, generally the already large land holder.

A large part of the public land suitable for cultivation lies within the forest belt at an elevation of from 1500 to 4000 feet; while many diverse views are held as to the wisdom of conserving this forest, it is a question of importance to the Territory and an added reason why the matter of the disposition of the public land should be cautiously dealt with.

Under the conditions as to the public lands and land laws, it is evident that the Survey Department has no light task in the laying out of lands for settlement.

To perform the work with accuracy, to furnish to the Commissioner of Public Lands the varied information required by him, to consider carefully the nature and value of the land, and to divide the same with reference to such nature and value, and with the further consideration of means of access to all lots laid

out, is the task before this office. The endeavor is and has been to spare no pains to do this work to the best interest of the community.

During the year ending June 30th, 1906, a number of tracts on the islands of Hawaii, Maui, Oahu, and Kauai, containing over 3500 acres, were subdivided into homestead lots for disposal under the land laws.

Detail surveys were made of twelve additional tracts containing an area of 9890 acres, and a number of forest reserves were located and described having a net area of 78,400 acres of public land. The nature of these tracts varies from valuable city lots and first class agricultural lands, to grazing fields of poor quality. Much of the land is of a rugged character and the isolated locations required extensive road surveys to make good connections with the nearest public main thoroughfares.

While doing the general field work, 36 school lots located at various points throughout the Territory were surveyed.

Much miscellaneous office work has neccessarily followed, but need not be detailed here.

The recent passage of laws for registration of land titles under the "Torrens" system has added in a considerable measure to the work of this office. All surveys and plans presented for registration are examined and checked in this office, and the necessary blue print copies of each (5) prepared here. All possible aid is given to the officers of the Court of Land Registration from the maps and records of this office, or by any explanations or information which it is in the power of the office to give.

The increasing number of petitions for registration is a gratifying indication of the growing popularity of a system that means much for the clearing up and simplification of titles in this Territory.

As to the survey needs of the Territory which this office has not the force to meet, a geological survey which would include a study of the water resources of the country appears most important. The richest soils of the country are in general the driest ones, and while private enterprise has done and is doing much to develop water resources and has reduced to cultivation much of this dry land, a more comprehensive study of the matter is needed. Waters are still running to waste that are needed for power and irrigation; tunnelling has developed considerable water and might develop much more with the help of better geological information; the conservation of storm waters is still in its

infancy. While the Survey Department is not equipped for the study of this matter, it is in a position to cooperate and assist any survey, Federal or Territorial, that might be intrusted with this important work.

Very respectfully,

WALTER E. WALL,
Surveyor.

His Excellency, G. R. CARTER,
Governor of the Territory of Hawaii.

REPORT

OF THE

SURVEYOR

TO THE

GOVERNOR

OF THE

TERRITORY OF HAWAII

FOR THE

Two Years Ending December 31, 1908

HONOLULU
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1939

TERRITORY OF HAWAII.

SURVEY DEPARTMENT.

Honolulu, Hawaii, January 16th, 1909.

SIR:—I beg to submit herewith a brief report of the operations of the Survey Department for the two years ending the 31st day of December, 1908.

Very respectfully,

WALTER E. WALL,

Surveyor.

To His Excellency, W. F. FREAR,

Governor of the Territory of Hawaii.

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TILDEN FOUNDATIONS.
1909

FIELD WORK

ISLAND OF HAWAII.

PUNA DISTRICT.

The work done in Puna district in this period was the subdivision of a portion of the land of Kamaili into homestead lots, and the subdivision of a portion of the Olaa tract at 28½ Miles on the Volcano Road into five-acre lots.

In the Kamaili subdivision, there were 6 homestead lots surveyed, and one marked out to be reserved for a school lot, making a total area of 473.73 acres.

The Olaa Summer Lots consist of 27 lots which were subdivided primarily as summer lots for residents of Hilo.

HILO DISTRICT.

Hakalau Surveys. The government land of Hakalau Iki was surveyed in order to consummate an exchange for portions of the privately owned land of Hakalau Nui, by which the government straightened out the boundaries of its land making this tract into one compact piece. With land acquired by exchange and the government remainder of Wailea adjoining, this tract has an area of 685.42 acres.

Laupahoehoe-Weloka Tract. In order to find the percentage of waste land to the cane land, it was necessary to make a classification survey of this tract. Of the total area of 3132 acres, 542 acres are waste or gulch land incapable of being planted in cane.

Lepoloa-Kauniho Tract. The matter of the boundaries of this land (surveyed during the preceding period) has not yet been settled with the owners of the adjoining land. A personal investigation on the ground has been made and a report submitted to the Attorney-General who will probably make application for a registered title under the Land Registration Act.

Kaapoko Homesteads. The government land of Kaapoko was subdivided into 11 lots totaling 114.17 acres. In addition to this, there is a park reserve of 1.8 acres on the south side of the government main road, a school lot of 6.2 acres on the north side, and a reserve lot of 13.25 acres between the school lot and the sea. The plantation roads through this tract have been used as homestead roads, of which there are 1½ miles.

School Lots. The following are the school lots surveyed in Hilo district during the period:

Papaikou School Lot, in Kaapoko, area....6.20 acres.
Pepeekeo School Lot, in Kulaimano, area..4.13 acres.
Haaheo School Lot, in Halepuna, area.....2.45 acres.
Puueo School Lot, in Puueo, area.....0.79 acre.

HAMAKUA DISTRICT.

Lots I and II of the Paauilo Homesteads, Second Series, were re-surveyed and marked.

A portion of the government land of Hauola was surveyed and marked out. This was for the Paauilo school lot exchange.

The school lots surveyed in this district were:

Honokaa Teachers' Cottage Lot, in Papaanui area.....1.5 acres.
Honokaa New School Lot, in Paalaea, area.4.0 acres.
Addition to Paauilo School Lot, in Kaohe, area .....2.0 acres.

KOHALA DISTRICT.

Kahei Homesteads. The upper portion of Kahei was subdivided into 15 homestead lots with a total area of 141.42 acres. The land is good agricultural land.

Kohala Mountain Forest Reserve. The survey of this proposed forest reserve included the mountain section of Waimea, in Kohala, and portions of the upper lands adjoining, in Hamakua district. In addition to this, the reserve will include the head of the Waipio gulch and its branches, in Hamakua, the upper part of Awini valley, the whole of Honokane valley and of Pololu valley, with the exception of the bottom lands, in Kohala. In this reserve, there are 14,365 acres of government land and 12,795 acres of privately owned land.

The Waimea School Lot was surveyed and marked out.

KONA DISTRICT.

Puuanahulu and Haleohiu Homesteads. Seven homestead lots and one school lot in the Puuanahulu subdivision were re-subdivided and re-marked, and the ten lots in the Haleohiu homestead tract were entirely re-surveyed, boundaries corrected, and accurate areas computed.

Haleohiu-Makaula Mauka Tract. Upon the survey and determination of the boundaries of the private land of Kau adjoining Haleohiu, it was possible to accurately describe and mark the boundaries of the Haleohiu-Makaula Mauka Tract. Its area is 82 acres.

Waiaha II. The Waiaha II subdivision, surveyed in 1906, instead of being opened up for homesteads, has been declared a forest reserve.

Honalo-Lehuula Boundary Survey. A question arising as to the proper boundary between the lands of Honalo (a recent government grant) and Lehuula (private land), a thorough survey and study of the various titles and boundary certificates affecting these lands was made, and the map has been completed.

Hienaloli 1st. Boundary. A re-survey was made of the land of Hienaloli 1st, for the Boundary Commissioner of the Third Judicial Circuit to conform to his decision on the boundaries of this land. Its area is 169.20 acres.

South Kona General Survey. The field work of the general survey of South Kona lands is just completed, and considerable map work and computations will have to be done before the results of the survey are available. The work included kuleana and grant locations, title studies and ahupuaa boundary surveys, and a general detail and topographic survey. The section surveyed extends from Hookena to the Kahuku boundary in the district of Kau, and from the sea to the Kahuku boundary mauka, and includes several thousands of acres of government land, the greater part of which is covered with dense forests of koa, ohia and other Hawaiian trees.

School Lots surveyed during this period were:

Alae New School Lot, in Haukalua, area...2.00 acres.

Puuanahulu School Lot, in Puuanahulu, area.....2.03 acres.

Kalukalu School Lot, in Kalukalu, area....1.41 acres.

Ninole and Wailau. The boundaries of the government remainders of the ahupuaas of Ninole and Wailau were surveyed and thoroughly marked. As there are many grants and kuleanas within and bordering on these two tracts, and two ahupuaas on either side owned by private parties, it was necessary to make a very careful study of titles and boundaries in order to determine the extent of the remaining public land.

Kaunamano Homesteads. The subdivision of this homestead tract was again changed to give an average area of 50 acres of cane land to the lot and varying areas of land suitable only for grazing purposes. The new lot corners have all been marked.

Hionaa-Kaalaiki. A location of the cane land in the Hionaa-Kaalaiki tract showed that about 200 acres had been abandoned as being unsuitable for cane growing. Of the 2200 acres in this tract, but 202 acres are now planted in cane, the balance being used as pasture land.

Alili Lease. A portion of the Moaula-Kopu-Makaka Mauka Tract was surveyed for the purpose of finding the areas of the cane and waste lands in order to fix the rental for leasing. It is called the Alili section and has an area of 169.5 acres. In this survey, a very careful title study of the boundaries of the adjoining grants was made.

Kaalaala-Makakupu Mauka Tract. The lease of a portion of the Kaalaala-Makakupu Tract expiring on July 1, 1908, a survey was made of this section to find areas of cane and other agricultural lands, pasture, and waste lands, in order to determine the rental for re-leasing. The total area is 3160 acres of which 1255 acres is cane land.

Miscellaneous Surveys. Lot 16 of the Kiolakaa-Keaa Homesteads was subdivided into two lots and at the same time the traverse was run of a proposed new homestead road through this tract.

Lot 55 of the Ninole-Wailau Homesteads was re-surveyed and marked, for the occupier of the lot.

The south line of the Puueo government lot recently sold was marked on the ground so that the purchaser could fence his lot.

A location survey of the proposed carriage and automobile road, leading from the Volcano House into the crater of Kilauea and to the edge of Halemaumau, was made. The grading and

construction work is being carried on by the County Road Board, and in the near future, parties will be able to view the active volcano from the seat of a motor car.

ISLAND OF MAUI.

West Maui Forest Reserve. An important survey was that of the West Maui Forest Reserve. This reserve takes in portions of 10 government lands with an aggregate area of 19,105 acres and 19 privately owned lands with an aggregate area of 25,335 acres. It encircles the western part of the island, including all the forest and mountain section and the sources of numerous streams. All prominent points on the reserve line are marked with forest reserve monuments.

Kamaole Homesteads. A portion of the Kamaole homesteads was re-subdivided into lots of one-half the area of the former lots, there being 12 lots in this new subdivision with an area of 295.41 acres.

Waiakoa Homesteads Makai. The makai portion of Waiakoa, adjoining the sea, was subdivided into 10 homestead lots with a total area of 309.10 acres. The beach is reserved.

Omaopio Remainder. The government remainder of Omaopio was surveyed and the areas of the waste and agricultural lands located. This survey was made for the proposed exchange of pineapple lands in Kuiaha and Pauwela, in Hamakualoa district.

Haleakala or Makawao Tract. Since the survey of this tract last period, a portion of it of about 1800 acres has been set aside as the "Makawao Forest Reserve." In addition, the Waihou spring and surrounding land, recently surveyed, and also situated in this tract, is to be set aside as a spring reserve.

Waikapu-Wailuku Road Encroachment. A portion of the Waikapu-Wailuku road was encroached upon by the Wailuku plantation. A survey was made of this road and the adjoining titles, in order to determine the area in question.

Ukumehame Survey. A topographic and classification survey was made of the unleased portion of the land of Ukumehame, and the government main belt road located. In this tract there is only 108 acres of cane land, the balance of 3600 acres being pasture, mountain and forest lands, and waste lands.

Lahaina Surveys. The reservoir lot in Lahaina, area one acre, situated near the road to Lahainaluna School, was surveyed, and

a description and plan furnished the Superintendent of Public Works.

The Alamihi pond and kula lot, a government remnant in Lahaina, was surveyed and marked out.

A title survey was made of the Lahaina School lot and adjoining properties.

Kuiaha and Pauwela Surveys. Portions of the lands of Kuiaha and Pauwela, near Haiku, in Hamakualoa district, are being surveyed for the purpose of consummating the exchange between the Baldwins and the government. According to the terms of the agreement a certain area of agricultural land in this section is to be given for the Omaopio remainder. There are a number of kuleanas in this tract, owned by different parties, and they all have to be located and marked before it is possible to determine the net areas of agricultural, waste and gulch lands. The Department of Public Works has located a system of roads through the tract which has been approved by the County Engineer of Maui, so that immediately upon the exchange being made, the proposed homestead subdivision will be marked out.

Waianu Surveys. The government remnants in Waianu Valley, Keanae, Koolau district, were surveyed and areas computed.

School Lots. The school lots surveyed on this island during the period are:

	Acres.
Lahaina—in Lahaina district	1.46
Olowalu—in Lahaina district	1.89
Spreckelsville—in Wailuku district	1.00
Wailuku—in Wailuku district	4.62
Makena—in Honuaula district	2.00
Ulupalakua—in Honuaula district	0.98
Keokea—in Kula district	4.02
Kihei (addition)—in Kula district	0.41
Kealahou—in Kula district	2.94
Paia—in Hamakuapoko district	1.26
Haiku—in Hamakualoa district	1.74
Halehaku—in Hamakualoa district	1.11
Kaupakulua (old and addition)—in Hamakualoa	2.04
Keanae (new)—in Koolau district	3.53
Nahiku (new)—in Koolau district	0.98
Ulaino—in Koolau district	2.88

ISLAND OF MOLOKAI.

School Lots. Nearly all the school and church grants on Molokai under the jurisdiction of the Department of Public Instruction, were surveyed and marked out, as well as additional lots for proposed exchanges for new locations of certain schools. The lots surveyed are:

	Acres.
Kalae (new and old)	3.363
Kaunakakai (new and old)	4.00
Kaluaaha (new and old)	2.04
Halawa (new)	1.295
Kawela	1.00
Kamalo	1.00
Honomuni	0.25
Lupehu	0.778
Kumueli Church	1.00
Halawa Church	0.734
Wailau Church (2 lots)	2.00
Wailau	0.144
Pelekunu School and Church	1.00
Pelekunu School	0.18
Pelekunu Church	0.17

Kalaupapa and Kalawao Villages. A location survey was made of all the buildings, roadways, pipe lines, etc., in the Kalaupapa and Kalawao villages at the Leper Settlement. Complete detail maps were furnished the Board of Health, and will be of value to the members in considering matters pertaining to conditions at the settlement, and more especially contemplated improvements.

ISLAND OF OAHU.

Tantalus Lots. Two portions of land on Tantalus Heights were subdivided into lots for mountain residences. One section, area 5.09 acres, was divided into 3 lots. The other section, area 89,100 square feet, on the ridge overlooking Manoa Valley, was divided into 8 lots.

Lualualei Homesteads, Second Series. That section of land at Lualualei, Waianae, between the von Holt grant and the railroad track of the O. R. & L. Co. was first subdivided into 6 lots averaging 100 acres: afterwards the subdivision was

changed to about one-half the size of the former lots; still later the boundaries of two lots in the subdivision were changed so as to exclude portions of the Puu o Hulu mountain within these lots. The land is not far from the sea shore and is mostly covered with algaroba. There are now in the tract 11 lots with a total area of 565.9 acres, and 2 government reserves of 188.1 acres.

Keaau Homesteads. The Keaau Homesteads comprise 9 lots with an area of 426.53 acres. This subdivision is situated in the government land of Keaau, Waianae, between the O. R. & L. Co. track and the lower line of the proposed forest reserve, and not far from Makaha. This tract is pasture land partly covered with lantana and kolu brush.

Pupukea-Paumalu Homesteads. The settlement of the Pupukea-Paumalu Homesteads having been so successful it was thought advisable to open up a few more lots in this tract even though the only available land is badly cut up by deep gulches. Three new lots were staked out on the upper lands; Lot 3 was divided into 2 lots, and a government reserve has been sold as a homestead lot.

Kaunala Lots. Three lots in the privately owned land of Kaunala, adjoining the above homestead tract, were surveyed and marked out.

Honouliuli Forest Reserve. The proposed forest reserve in the land of Honouliuli, on the southeast slopes of the Waianae range and adjoining the Lualualei Forest Reserve, contains 5640 acres. Twelve forest reserve monuments have been placed along its boundary at important points.

Keaau-Makua Forest Reserve. That section of Waianae district on the west slopes of the Waianae range and between the lands of Makaha and Keawaula was surveyed and marked out as a forest reserve. It is called the "Keaau-Makua" Forest Reserve and consists of the upper portions of 3 government lands, area 4480 acres, and one privately owned land, area 340 acres.

Waimanalo Survey. A detail and location survey was made of Waimanalo village, Koolaupoko, and of the cane fields in the vicinity.

School Lots. The school lots on the Island of Oahu, surveyed in this period are:

	Acres.
Waianae (new)	2.84
Honouliuli (old and new)	3.954
Aiea, in Kalauoa (old and addition)	2.41
Kaaawa (new)	1.05
Waimanalo (old and addition)	0.758
Pauoa (new)	1.942
Pohukaina (old and addition)	1.12
Royal School (addition)	0.41
McKinley High School (new and addition)	2.22

Miscellaneous Surveys. The forest reserve line across the land of Waianae Uka, and the boundary between this land and Wahiawa were run out and marked on the ground.

Surveys were made of the government roads in Waiahole (Land Registration cases), the scene of a murder at Aiea, and the scene of cattle stealing at Wahiawa, for the Attorney-General; of a sewer ditch line at Aiea for the Board of Health; of certain water lots in Pearl Harbor, and of the old and new government roads in Waipio, for the Superintendent of Public Works; and of the Waialua Road through Waianae Uka for descriptions of portions of the military reservation.

Honolulu Miscellaneous Surveys.

Government lot, Nuuanu Valley, Jones application.
Government lot, Nuuanu Valley, Wilder application.
Government lot, Nuuanu Valley, application for lease.
Government lot, Nuuanu Valley, Hanaiakamalama.
Muhlendorf lot, Makiki Valley.
Government lot, Makiki Valley, Howard application.
Government lot, Makiki Valley, for Board of Agriculture and Forestry.
Government lot, Kaluaopalena Makai, Young application.
Government remnants, Kaluaopalena Mauka.
Government lots (3), Tantalus Heights, Giffard application.
Government remnants (8), Pauoa Valley, Booth exchange.
Government lot, Iwilei, portion Wash House lot.
Government remnants and Kuleanas, Kuwili section, Iwilei.
Government remnant, School street, Kalaolao application.
Government lot, Alapai street, Bailey application.

U. S. Experiment Station lot, King Street and Kalakaua Avenue.
U. S. Experiment Station, Kewalo Uka. Survey of buildings and experimental fields.
Lot for Home for Non-Leprous Children, Kapalama Kai.
Dowsett Lot, Foundry Block, King Street.
Diamond Head Reservoir sites (2).
Diamond Head Reservoir right-of-way.
Rifle Range site, Kakaako.
Rear Range Light Station site, foot of Fort Street.
Outrigger Club lot, Waikiki.
Block survey, King, Punchbowl, Hotel and Likelike Streets.
Liliha Street widening, Pahu lot.
Bishop Street extension, King Street to Waterfront.
Green Street extension.
Kuakini Street extension, Nuuanu Avenue to Fort Street.
Kakaako Street extension, Halekauwila to Punchbowl Streets.
Boki Road opening, Liliha Street to Alewa Heights Road.
Gulick Avenue line marked out.
Re-location of certain kuleanas in Palolo Valley.
Location of buildings on Waiaka government land.
Walks and Driveways, Capitol and Judiciary grounds.
Driveway, Kalihiwaena School.
Determination of azimuths between Ala Moana monuments.
Street lines and azimuths determined, corner of Beretania Avenue and Punchbowl Street.
Check surveys of Land Registration petitions:
Manoa Valley, Iwilei, Alakea and Merchant Streets, Kunawai, and Palama.

ISLAND OF KAUAI.

Kalaheo Homesteads. As mentioned in last report, over 900 acres in Kalaheo were subdivided into 93 lots; since then another section of Kalaheo below the government main road has been subdivided into 26 lots with an average area of over five acres

Mana Lots. A portion of Mana, in Waimea, along the sand plains near the beach, was subdivided into 4 lots of a little over 500 acres each. These lots were to be used for planting of sisal if acquired by the applicants.

Kuiloa Survey. The boundaries of the ili of Kuiloa in Hanapepe, as well as that portion of the boundary of Hanapepe adjoining the ili of Eleele, have been surveyed and substantially marked. This work was done in accordance with a decision of the Supreme Court defining the boundaries of Kuiloa.

Hanapepe Kuleanas. The location of the kuleanas, in Hanapepe Valley was of some importance, being necessary in order to determine the balance of government land in the valley, and in view of the fact that kamaainas are getting scarcer every year.

Moloaa Forest Reserve. The Northeast line of the proposed forest reserve in Koolau district, between the "Kealia" and "Halelea" forest reserves, has been marked with the regular monuments. The Southwest line follows the ridges bounding the lands. This tract is back of the Kilauea plantation and the Moloaa Hui lands, and contains 3615 acres of government land and 2055 acres of privately owned lands.

Lihue-Koloa Forest Reserve. The upper and mountain section of the Island of Kauai from Hanapepe in Kona district to Kapaa in Puna district, and including portions of 10 lands, has been surveyed and marked out as a forest reserve. When this tract is set aside for forestry purposes, it will complete the circuit of the island. In this reserve, there are 12,945 acres of government land, and 16,315 acres of privately owned land.

School Lots. But two school lots were surveyed in this period: the Hanapepe New School Lot, area 5.40 acres, and the Kapaa School Lot, area 4.00 acres.

Kapaa Surveys. The surveys in the Kapaa-Kealia section required a great amount of field work, such as general topographic surveys, measurements of stream flows, subdivisions of different classes of homesteads, classifications and areas of various qualities of lands, the laying out of the Kapaa town lots and the locating of the boundaries between the ahupuaas of Waipouli and Olohena, Olohena and Wailua, and Kamalomalo and Kealia.

The subdivision of the cane lands into homesteads, mentioned in the last report, was completed; but the map work has not yet been finished, as orders for the discontinuance of this work were given early in August, 1907, and the proposed subdivision of the mauka or so-called pineapple lands, and the 999-Year homestead lease lots of taro and kula land was commenced.

In the section above the limits of the cane fields, 46 parcels were marked out as wet land, or taro and rice lots, with nearly the same number of kula or house lots, to be opened up under the 999-Year Homestead Leases. These lots average about one acre of wet land, and 3 to 4 acres of kula land.

There have also been marked out in this mauka section, as general agricultural land, 15 lots of from 3 to 10 acres along the banks of the Kapaa river; 6 lots of from 48 to 60 acres on the North side of the river; 7 lots of from 35 to 42 acres on the South side of the river; and 4 lots of from 64 to 90 acres near the Waipouli boundary. The endeavor, in the subdivision of the larger lots, was to have an average of 35 acres of good agricultural land, the balance being either waste or pasture, but in the case of the 4 lots of from 64 to 90 acres, it was not possible to get even that average on account of the numerous gulches in the tract. The lots were laid out in such a manner as to give each access to a ditch or flume now constructed, or that could be constructed, so that all parts of each lot could be irrigated.

Measurements were made of the stream and spring flows, and preliminary surveys were made of proposed ditch lines by which the stream could be tapped at higher elevations than at present, thus placing a larger area of land suitable for irrigation.

In order to have accurate data for the proposed exchange with the Makee Sugar Co. of lands in the Kapaa section, it was necessary to make a classification survey of the lands of North Olohena, South Olohena, Waipouli, Kapaa, Kamalomalo and Anahola. This classification consisted of grading the lands as, first, second and third class cane lands, rice lands, agricultural lands (other than cane), kula land on the flats, pasture lands, waste lands, swamp lands, forest lands, roads, kuleanas, and reservoirs, and the computation of their areas. This information was of value to the commissioners appointed to appraise the different lands. The records of the stream measurements, and the surveys made to determine the feasibility of irrigating the larger area of the upper lands, were also useful to the appraisers.

In this connection, the Olohena-Waipouli and the Olohena-Wailua boundaries were surveyed and determined right up to the main range, and the sources of the various streams running through these lands established.

After much preliminary work and trouble with the holders of one or two kuleanas, the subdivision of the flat land near the

beach has been completed into what is called the Kapaa Town Lots. The land includes the site of the Kapaa village and vicinity and has been laid out into blocks, with provision for streets, park reserves, church lots, and public building lots, as well as the lots for residents of Kapaa village. The government main belt road runs through the middle of the town, and special attention was paid to the sanitary aspects of the subdivision. There are sixteen blocks in this town site with varying number of lots of varying sizes, a total of 171 lots, the majority being however of a uniform size of 50 by 150 feet.

SUMMARY OF FIELD WORK.

SUBDIVISIONS.

ISLAND OF HAWAII.

	Lots.	Acres.
Puna District.		
Olaa Summer Lots	27	137.17
Kamaili Homesteads	6	472.30
Hilo District.		
Kaapoko Homesteads	11	114.17
Hamakua District.		
Paauilo Homesteads	2	117.25
Kohala District.		
Kahei Homesteads	15	141.42
Kona District.		
Puuanahulu Homesteads	7	49.15
Haleohiu Homesteads	10	82.01
Kau District.		
Kaunamano Homesteads	32	1941.82
Lot 16, Kiolakaa-Keaa Homesteads	2	39.10
Lot 15, Ninole-Wailau Homesteads	1	0.80

ISLAND OF MAUI.

Kamaole Homesteads	12	295.41
Waiakoa Homesteads Makai	10	309.10

ISLAND OF OAHU.

Tantalus Lots	11	7.55
Lualualei Homesteads	11	565.90
Keaau Homesteads	9	426.53
Pupukea-Paumalu Homesteads	5	455.70

ISLAND OF KAUAI.

Kalaheo Homesteads	26	142.23
Mana Lots	4	2052.00
Kapaa Homestead Lease Lots	92	152.00
Kapaa Homesteads	40	987.10
Kapaa Cane Lots	...	.....
Kapaa Town Lots	171	56.50

SCHOOL LOTS.

ISLAND OF HAWAII.

	Lots.	Acres.
Puna District	1	1.43
Hilo District	4	13.57
Hamakua District	3	7.50
Kohala District	1	1.46
Kona District	3	5.44
	12	29.40

ISLAND OF MAUI.....16 Lots, 32.86 Acres.
ISLAND OF MOLOKAI..... 19 Lots, 18.954 Acres.
ISLAND OF OAHU..... 10 Lots, 16.704 Acres.
ISLAND OF KAUAI..... 2 Lots, 9.40 Acres.

FOREST RESERVES.

Koa Forest Reservation, Olaa, Puna, Hawaii.. 7.45 Acres.
Kohala Mountain, Kohala and Hamakua, Hawaii.....27,160.00 Acres
Waiaha Spring, North Kona, Hawaii..... 193.42 Acres.
West Maui, Lahaina, Kaanapali, and Wailuku Districts, Maui.....44,440.00 Acres.
Waihou Spring, Makawao, Maui..... 84.00 Acres.
Honouliuli, Ewa, Oahu..... 5,640.00 Acres.
Keaau-Makua, Waianae, Oahu..... 4,820.00 Acres.
Moloaa, Koolau, Kauai..... 5,760.00 Acres
Lihue-Koloa, Kona and Puna, Kauai.....29,260.00 Acres.

DETAIL SURVEYS.

ISLAND OF HAWAII.	Acres.
Hakalau Iki, Hilo District	685.42
Laupahoehoe-Weloka Tract, Hilo District	3,132.00
Lepoloa-Kauniho Tract, Hilo District	308.00
Hauola Government Lot, Hamakua District	2.00
Haleohiu-Makaula Mauka, Kona District	82.00
Honalo-Lehuula Boundary Study, Kona	.....
Hienaloli 1st. Boundary Survey, Kona	169.20
South Kona General Survey	112,000.00
Ninole Government Remainder, Kau	329.00
Wailau Government Remainder, Kau	344.00
Hionaa-Kaalaiki Cane Area, Kau	202.00
Alili Section, Kau	169.00
Kaalaala-Makakupu Mauka Tract, Kau	3,160.00
Kiolakaa-Keaa homestead road, Kau	1 Mile.
Halemaumau Road, Kau	7 Miles.
ISLAND OF MAUI.	
Omaopio Remainder, Kula	888.00
Waikapu-Wailuku Road Encroachment, Wailuku	4.22
Ukumehame Classification Survey, Lahaina	3,708.00
Lahaina Town Surveys, Lahaina	6.25
Kuiaha-Pauwela Surveys, Hamakualoa	.....
Waianu Valley Remnants, Koolau	11.34
Ukumehame Belt Road	4 Miles.
ISLAND OF MOLOKAI.	
Kalaupapa and Kalawao Villages	.....
ISLAND OF OAHU.	
Kaunala, Koolauloa	133.00
Waiahole Roads, Koolaupoko	.....
Portion Waimanalo, Koolaupoko	480.00
Waianae Uka Forest Line	.....
Waipio Roads, Ewa	.....
Pearl Harbor Water Lots, Ewa	.....
Aiea Ditch Line, Ewa	.....
Honolulu City,—46 Miscellaneous Surveys	.....

ISLAND OF KAUAI.

Kuiloa Boundary Survey	
Hanapepe-Eleele Boundary Survey	
Hanapepe Valley Kuleanas	
Kapaa Section:	
South Olohena	1,215.00
North Olohena	1,153.00
Waipouli	2,966.00
Kapaa	7,699.00
Kamalomalo-Anahola	8,646.00

OFFICE WORK.

Neither the field nor the office work of the period has differed essentially from that of the past period, though perhaps more has been done to bring the maps and records up to date.

The office work has consisted mainly in mapping the homestead and other tracts, and furnishing tracings, prints and descriptions of the subdivisions or lands offered for sale or lease. The field operations which included quite a number of important boundary locations between private and public lands have been of such a nature as to require much office work in the compilation of data, working sheets, etc.

Assistance was rendered the Land Office in revising and correcting the list giving the names, areas, etc., of the public lands.

The tide gauge has been kept in operation during the period, and the time signal service improved. This improvement was made by the County Electrician who has perfected the electrical connections to the whistle so that the time signal is now set off from this office with such precision that the slight error of transmission need no longer be given any consideration.

Special maps of the counties, showing the election districts and voting precincts, were prepared for the Secretary's office, and a tracing of them made so that blue print copies might be furnished when needed.

A new group map of the islands, such as will be of value in the public schools and commercial houses, is now under compilation, and will be completed in the near future.

The office records are being constantly consulted by private parties as well as public officials, and much time of the office

assistants is occupied in giving out information on a variety of matters pertaining to land transactions.

The following is a brief summary of some of the office work:

Descriptions of surveys and plans furnished	454
Court of Land Registration Surveys and Titles examined and reported on	49
Tracings furnished	162
Blue Prints furnished	1743
Official Letters—received	1000
Official Letters—written	635
Field Books registered	101
Maps registered	80

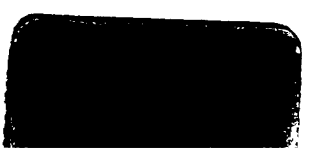
EXPENDITURES AND RECEIPTS

FOR THE TWO YEARS ENDING DECEMBER 31, 1908.

EXPENDITURES.

Specific Salaries	$17,160.00
Expenses of Field Parties and Office Work.	32,666.75

RECEIPTS.

Published Maps	$ 190.50
Blue Prints	232.95
Tracings	116.85
Professional Services	51.50
Rating Chronometers and Time Service	20.00
Post Office Box-rent overcharge	.50
Sale of Parallel Ruler	7.50
	$ 619.80

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